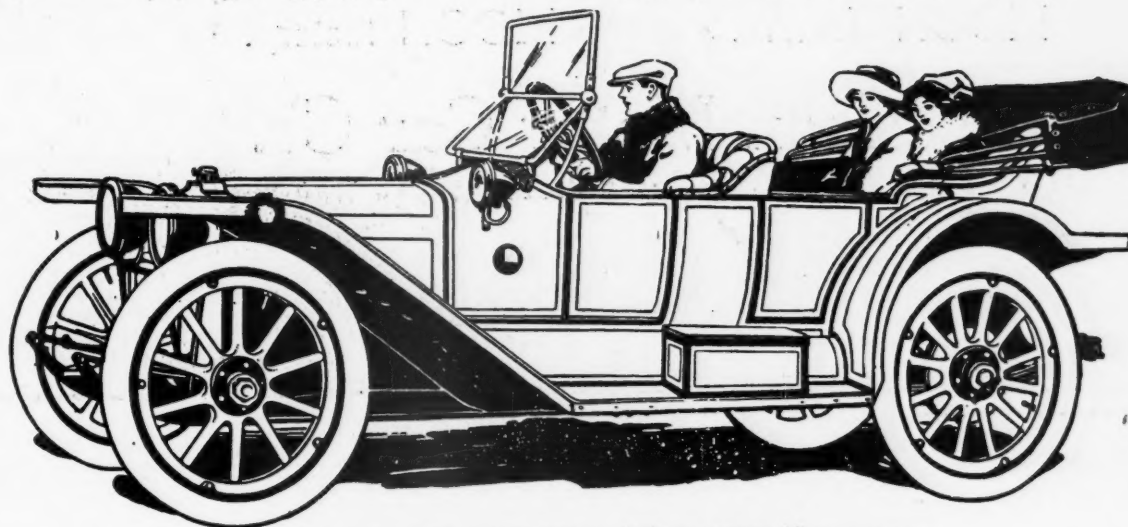


# MOTOR AGE

VOLUME XXIII

CHICAGO, JANUARY 16, 1913

NUMBER 3



*The "American Tourist" (Type 34-A) \$2350—Complete*

*Electrically  
Lighted*

## AMERICAN UNDERSLUNG

*Electrically  
Started*

### Comfort!

**Y**OU can drive an "American Underslung" over a series of two-by-four timbers at fifteen miles an hour and the plane of the underslung frame will not be perceptibly disturbed. The underslung construction permits greater riding ease than that found in any other automobile.

The "American Underslung" design permits no sidesway—and no shocks on the frame. You can tour one-third more miles in a day with less fatigue. And you can cover the same distance at from 10 to 20 miles greater speed.

Be sure to see the new models at the Grand Central Palace Show.

*The "American Scout" - - - - \$1475 Complete*

*The "American Traveler" - - - - \$4500 Complete*

*(Improved Electric-Starter with Tourist \$150 extra)*

**American Motors Company, <sup>Dept.</sup> H, Indianapolis, Ind.**

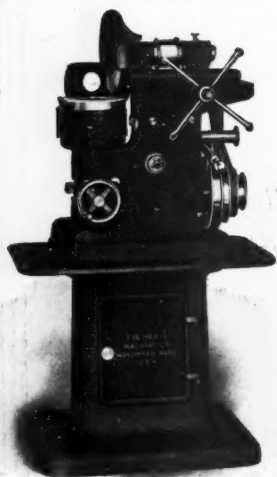
THE new cowl on 1913 MOON cars brings the windshield much nearer the driver and adds to the "stream-line" effect.

¶ It's an exclusive MOON feature.

¶ That's just an illustration of the careful way in which all the details of MOON construction are planned out—a reason for the remarkable growth of the MOON factory.

## Moon Motor Car Co.

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are both desirable when finishing piston rings. One machine may produce Quality and another Quantity, but you get both at the same time on the

## HEALD PISTON RING GRINDER

As proven by long experience in hundreds of shops, both in this country and abroad. It is without an equal for finishing piston rings rapidly and accurately to thickness.

Rigid construction, accurate micrometer feed of the chuck toward the grinding wheel, and simplicity of operation are responsible for its success.

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The extreme simplicity of this machine makes it easy for a boy to operate.

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(Patented)

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THE use of the Perkins Condensing Dry Room is saving the large corporations of the country millions in invested risks, and factory floor space, by reason of the rapidity of the process, which also means factory efficiency. All varnish dried by our process has a more brilliant, more durable body.

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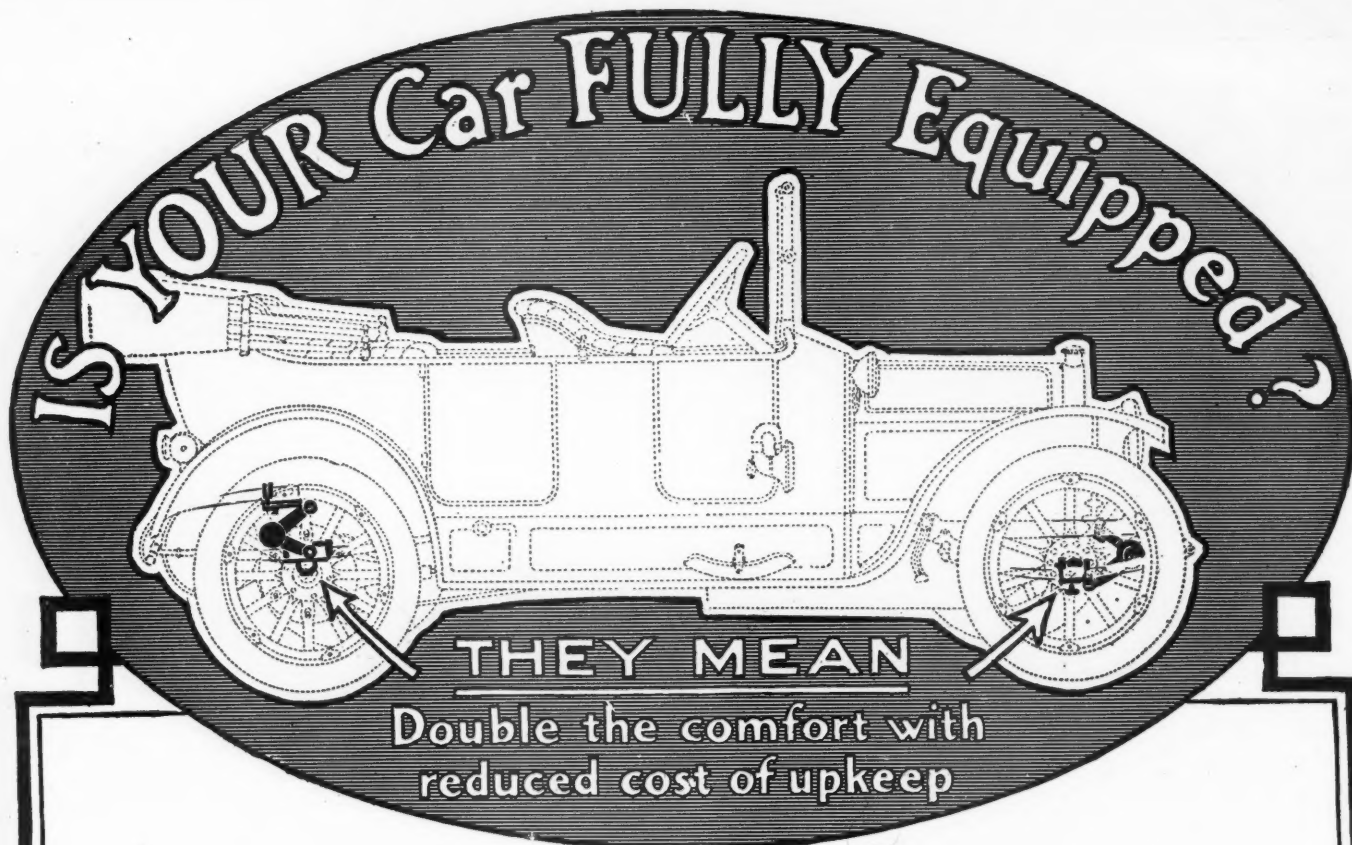
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A car is not *completely* equipped if it is not Truffault-Hartford-equipped. You will realize this as soon as you ride on a set. For *comfort*, for *economical upkeep*, for *real immunity from spring breakage and from excessive tire ills*, the Truffault-Hartford is *indispensable*. Ask any of the 200,000 and more motorists now using it.

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# See It At The Shows

## The First Perfect Starter

For 1913, we offer the Automobilists of America the **Electric Disco Starter**.

This is, we believe, the first and only **perfect** Starter, and for that reason you should be sure to see it and inspect it at the Automobile Shows.

In the **Electric Disco**, you'll see a Starter that actually **SPINS** the motor.

It doesn't merely turn over the engine or crank it. By pressing a button, the engine instantly begins to **SPIN**.

It turns the engine at from 110 to 150 revolutions per minute.

That's 50% faster than any other Starter.

And it's so fast that, no matter how **large** or how **cold** your engine may be, it sucks up and vaporizes the gasoline so that the car is under way in a moment after pressing the button.

Even though the **Electric Disco** costs more than any other, leading auto makers are glad to build it into their cars. They are delighted at being able to secure a really **dependable** Starter. Ask for it.

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not only **starts** the car but supplies an **abundance** of electric lighting power for all lamps.

It consists essentially of a small, compact Motor, a Generator of approximately the same size and a Storage Battery.

The Generator produces ample current for **Starting** and **Lighting** any car.

The entire System is a marvel of **efficiency** and **simplicity**.

Don't fail to see the **Electric Disco** at the Shows.

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Remember, a good car **isn't** a good car nowadays unless it has an absolutely **reliable** Starter.

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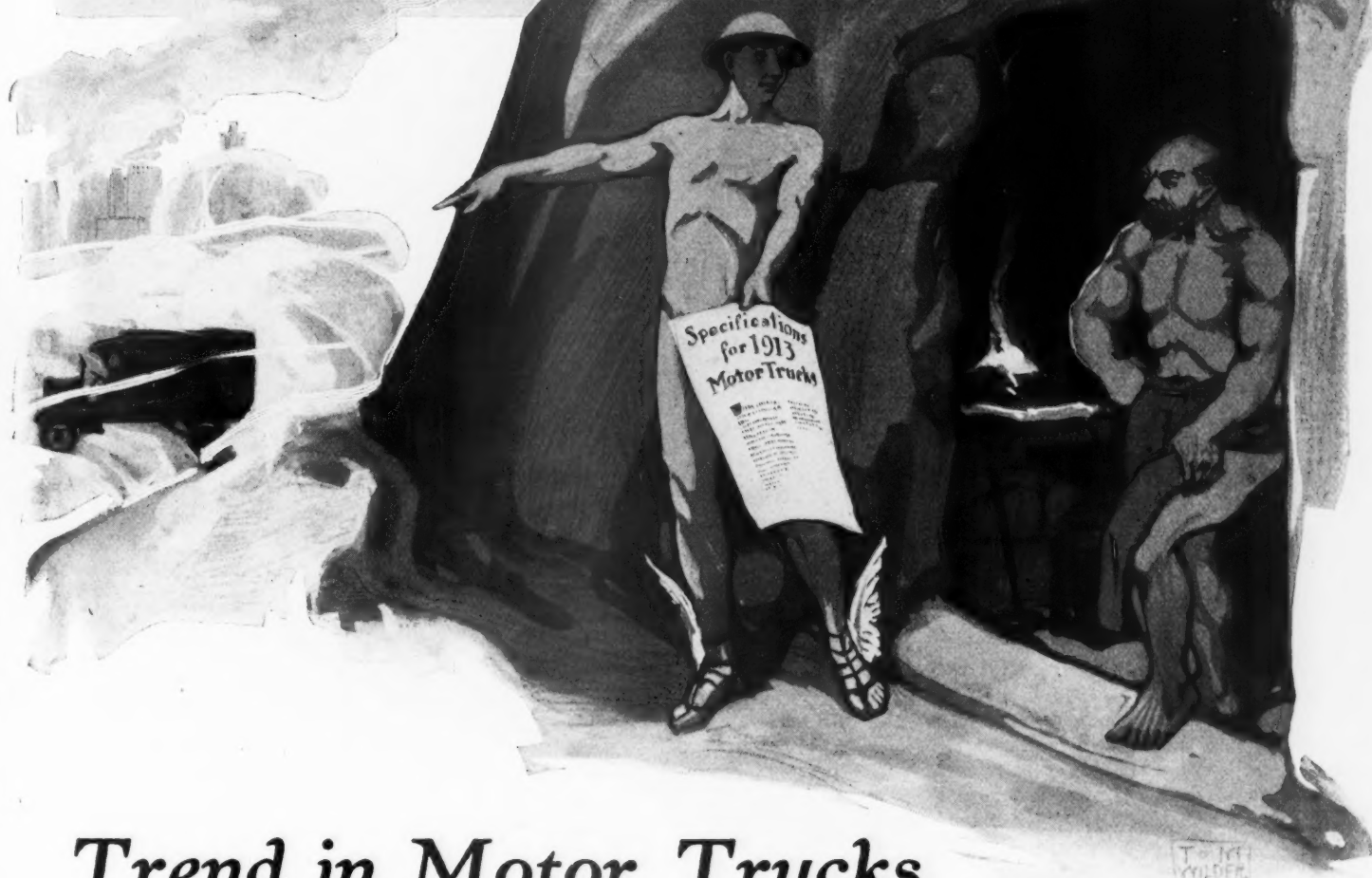
At the Chicago Show, Feb. 1-15,  
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### Ignition Starter Company

710 Dodge Building

Detroit, Michigan

# MOTOR AGE



## Trend in Motor Trucks

*Concise Story of Advancement Made by Designers of Commercial Vehicles—Industry Shows an Increase of 12 per cent in Number of Manufacturers*



THE opening of the first American exhibition of commercial vehicles for 1913 marks another step forward toward an ideal road transportation of merchandise, New York being the focus of attention of every man interested in power wagons, whether manufacturer, dealer or user. Here they may have the opportunity of studying the newest applications of motor power to road hauling, of following the trend of development, of studying those changes which make for increased service. Just what those changes and perfections would be he has not known, though many conjectures have been made.

Students of the commercial vehicle will

**By William B. Stout**

be astonished at the number of new names which are entering into the industry, many of them with promise. Though thirty-eight motor truck manufacturers have dropped out during the past year, the number of makers this year has been increased over last year's figure by a score. The difference in the figures announces the presence of some thirty-five new makers, many of them showing their cars in the eastern show and some waiting for the exhibits further west, but all listed in the industry and planning to show their merit in business service during the coming year.

While the commercial vehicle makers have gained almost 12 per cent in numbers during the twelvemonth, the makers of pleasure cars have decreased 19 per cent. By this it is evident that there is more commercial confidence today in the motor truck branch of the motor vehicle industry than in the pleasure car end.

Several concerns of prominence have left the industry, but where there have been failures 90 per cent have been from business reasons rather than due to mechanical details. Some have been due to too much engineer in the plant and not enough practical man; some to lack of office management, others to service guarantees that could not be lived up to, or to lack of capital at crucial moments, but there have been very few failures due to impractical truck design or construction.

The newcomers make a long list, and while some were heard of last year, had not really entered the field until this year's show. Among the nameplates seen perhaps for the first time by the public are those of the A and R, 3, 4 and 5-ton machines; the Available, Brockway, Bucklin, Continental, Crescent, Elk, Gabriel, Hercules, Jarvis, Kadix, built in capacities from 3 to 5 tons; the Lange, Lewis, Toledo, Transit, Tulsa, White Star, Willet and Zimmerman.

#### Some Average Statistics

The general figures for this year's motor trucks, their general specifications and forms of construction show a decided tendency toward certain lines. The following tables and charts show some of the more prominent ideas which are gaining, or are in process of elimination. For instance, the table below shows the present averages in each class relating to price, load capacity, chassis weight, horsepower, wheelbase, etc.

Capacity Tons	Price	Capacity Chassis	Weight	Horse Power	Wheel Base
Under 1	\$1,114	1,580	1,975	22.0	105
1 to 2	1,830	2,370	3,118	25.4	127
2 to 3	2,670	4,150	4,220	30.0	132
3 to 4	3,320	6,225	5,940	34.0	148
4 to 5	3,870	8,050	6,500	37.0	150
5	4,365	10,000	7,750	38.2	150
Over 5	5,140	13,200	8,166	39.0	150

These averages by class work out for an average car a price of \$3,100, a capacity of a little less than 3 tons, a chassis weight of 5,000 pounds, a motor of 32 horsepower, and a wheelbase of about 130 inches.

Following present constructions and referring to Chart I it will be seen that the size of motor vehicle offered by the largest number of makers lies between 1 and 2 tons—an average 1,500-pound-capacity machine. Of 300 types listed seventy-five are in this class. The next in order is the less-than-1-ton division, with the 3-to-4-ton class third.

These are merely figures of the types listed by different manufacturers and give no indication of the number in each class sold. It is probable that the sales would follow pretty generally this outline, however. The 2-to-3-ton class is low, presumably on account of the speed differences between the 1-2-ton vehicles on pneumatic tires and the 3-to-4-ton on hard tires. The 2-to-3-ton machine bridging this class is hindered on one side by the pneumatic smaller machine which can make better speed and hence more deliveries per day, and the 3-to-4-ton machine on the other side making about the same speed, costing but little more and carrying enough load more than the pneumatic-tired vehicles so that it can compete on day's work average with the swift types.

While discussing sizes of vehicles a

tendency on the part of merchants is responsible for the use of so many of the small vehicles, for they find in many lines that by putting on a 3-ton truck to take the place of two 3-ton wagons the flexibility of the delivery system is hampered, and so choose two 1½-ton delivery wagons instead, each taking the place perhaps of a 3-ton horse vehicle or its equivalent, and doing twice the mileage. If one machine is laid up for overhaul there is still one in service, so that service is more flexible.

#### Demand for Small Vehicles

There is but little doubt but that the greatest field at present open to the motor truck maker is in the small vehicle line, and yet the small rig is the least developed or perfected of any. Constructions in this class are still a jumble of ideas. The reason is that the small vehicle of the

present type if built as carefully with the same construction as the 1-tonners would cost almost the same to build, so that in the under 1-ton class makers are trying to evolve cheaper constructions. Those firms that try to save on workmanship will lose out

through failures of machines; those saving by slighting mechanical details will suffer in the sales cost, the attempt to make the small vehicle a success for speed on hard tires of small size is sure to fail. It would seem that there must enter a new vehicle for this class before the corner grocery and general store will buy. This may be a car built on motor cycle lines like the new European parcel-cars, but on four wheels. The three-wheel idea fails on rough roads. The firm first furnishing a reliable, simple, well-built car for this work in a light weight will find themselves swamped with orders. But the vehicle must be reliable and not cheaply built. Such a car is possible.

#### Prevailing Construction

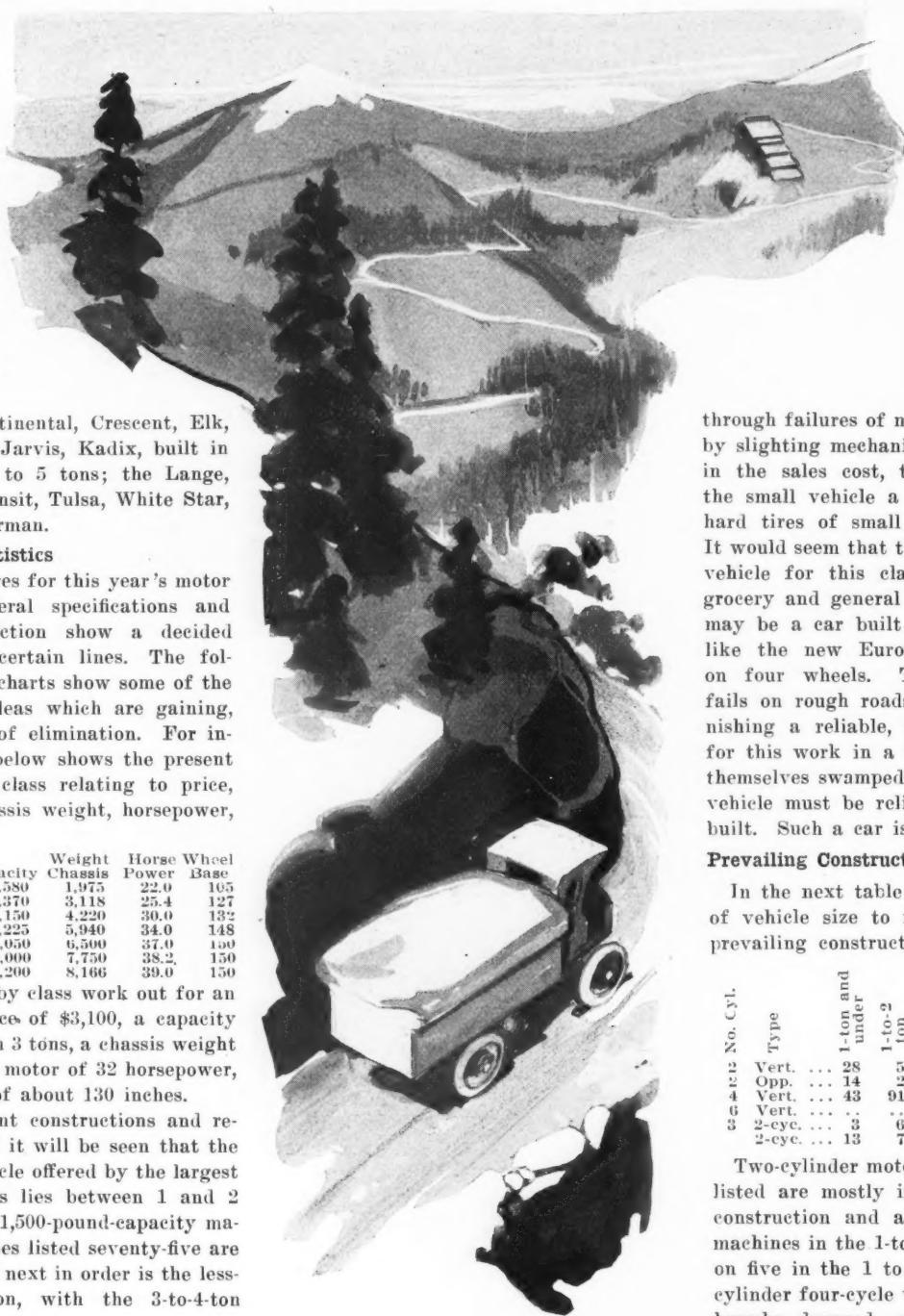
In the next table is shown the relation of vehicle size to motor design and the prevailing constructions:

No. Cyl.	Type	1-ton and under	1-to-2 ton	2-to-3 ton	3-to-4 ton	4-to-5 ton	5-ton ton	Over 5-ton ton
2	Vert. ...	28	5	..	..	..	..	..
2	Opp. ...	14	..	..	..	..	..	..
4	Vert. ...	43	91	45	60	19	43	13
6	Vert. ...	..	..	1	1	..	..	..
3	2-cyc. ...	3	6	..	..	..	..	..
2	2-cyc. ...	13	7	3	..	..	..	..

Two-cylinder motors of the vertical type listed are mostly if not all of two-cycle construction and appear on twenty-eight machines in the 1-ton or under column and on five in the 1 to 2-ton class. The two-cylinder four-cycle vertical motor has been largely dropped, mainly on account of difficulty in balancing.

The early type of two-cylinder opposed motors has been dropped from the big machine classes, and appears on the smaller cars up to 2 tons capacity only. Fourteen are shown in the under 1-ton class, some of which are two-cycle, and two in the 1 to 2-ton class. The small number shown in this class is more or less of a surprise, but with the advent of long-stroke motors an even smaller showing is to be expected, as a motor of this type set crosswise of the frame is of necessity a short-stroke proposition.

The four-cylinder motor has the lead without competition to speak of. Forty-three are shown in the 1-ton column, ninety-one in the 2-ton, forty-five in the 3-ton, sixty in the 4-ton, nineteen in the 4 to 5-ton and forty-three in the 5-ton. As to





six-cylinder motors these are shown on but two machines, one in the 2 to 3-ton class and the other in the 3 to 4-ton.

The two-cycle motor on small cars shows a gain this year, but whether a permanent one or not remains to be seen. The three-cylinder motors listed are of course all of two-cycle construction and all being on machines under 3 tons. The two and four-cylinder motors of this class are also in the under 3-ton classes.

There seems to be a set opinion at present favoring the four-cylinder four-cycle motor, but whether the start made with six-cylinder installations will result in a general change to that class remains to be seen. It is not probable that there will be the rush to sixes seen in the touring car class, as the four-cylinder as it is is well adapted to the work in hand. Future changes will be more in the nature of fool-proofing devices and refinements giving greater efficiency. The present motor truck motor can stand much of development toward greater fuel efficiency.

#### The Ignition System

As to carbureters there is a gain in heated vaporizing chambers or packeted constructions to deal with the continually poorer grade of gasoline being furnished, and its slower vaporizing qualities. The table below shows the ignition situation, fixed ignition having made a great gain in all sizes:

	SYSTEM			
	Single	Dual	Double	Optional
1 T and under..	35	32	6	1
1-2 T.....	32	50	14	5
2-3 T.....	9	30	9	2
3-4 T.....	11	41	10	2
4-5 T.....	4	11	2	1
5 T.....	3	31	10	1
Over 5 T.....	1	6	2	1

	CONTROL			
	Hand	Fixed	Governed	Automatic
1-ton and under..	53	15	3	1
1-2 ton.....	69	13	5	7
2-3 ton.....	36	6	1	8
3-4 ton.....	43	7	8	6
4-5 ton.....	9	7	1	5
5-ton.....	34	8	1	3
Over 5-ton.....	7		1	

While the table shows dual ignition in the lead this condition probably will not hold for long with the new magneto improvements that have been made. The need for two sets of ignition apparatus is becoming less every day.

The next vehicle part in the line is the clutch, and in this class, as in the list below, the contest is shown still to be on between the cone and disk clutch types. The latter has the advantage by a majority of twenty-nine; external band is a poor third, while

eight concerns give options in this department of construction. The table is given herewith:

	CLUTCH TYPES			
	Disk	Cone	External Band	Optional
1 T and under..	29	28	2	
1-2 T.....	42	42	2	5
2-3 T.....	30	18	1	
3-4 T.....	41	22	1	1
4-5 T.....	6	12	1	1
5 T.....	25	18		1
Over 5 T.....	4	8		
Totals.....	177	148	5	8

Contending for first place with the cone

type in the lead on smaller types, as in table 5, the situation is mixed and both types are making good. Disk clutches are now made which do not slip, and cone clutches have been perfected which do not jam.

To note the peculiarities of the disk type leads by one in the under 1-ton class, is even in the 2-ton and away ahead in the 3-ton and 4-ton divisions. In the 4 to 5-ton class the cone leads, but in the 5-ton column the disk is again in the lead. For over 5 tons the cone is ahead. Contracting band and expanding band constructions are still a small minority and show no gain. The disk construction, as the statistics of 1913 show very clearly, leads in total number.

That the disk clutch should dominate will be evident when it is remembered that the driver of a commercial vehicle is not always able to use the cone clutch properly. In a number of instances it has been shown that the driver cannot start his car with a jerk, thus putting undue strain on the parts.

#### Gearset Situation

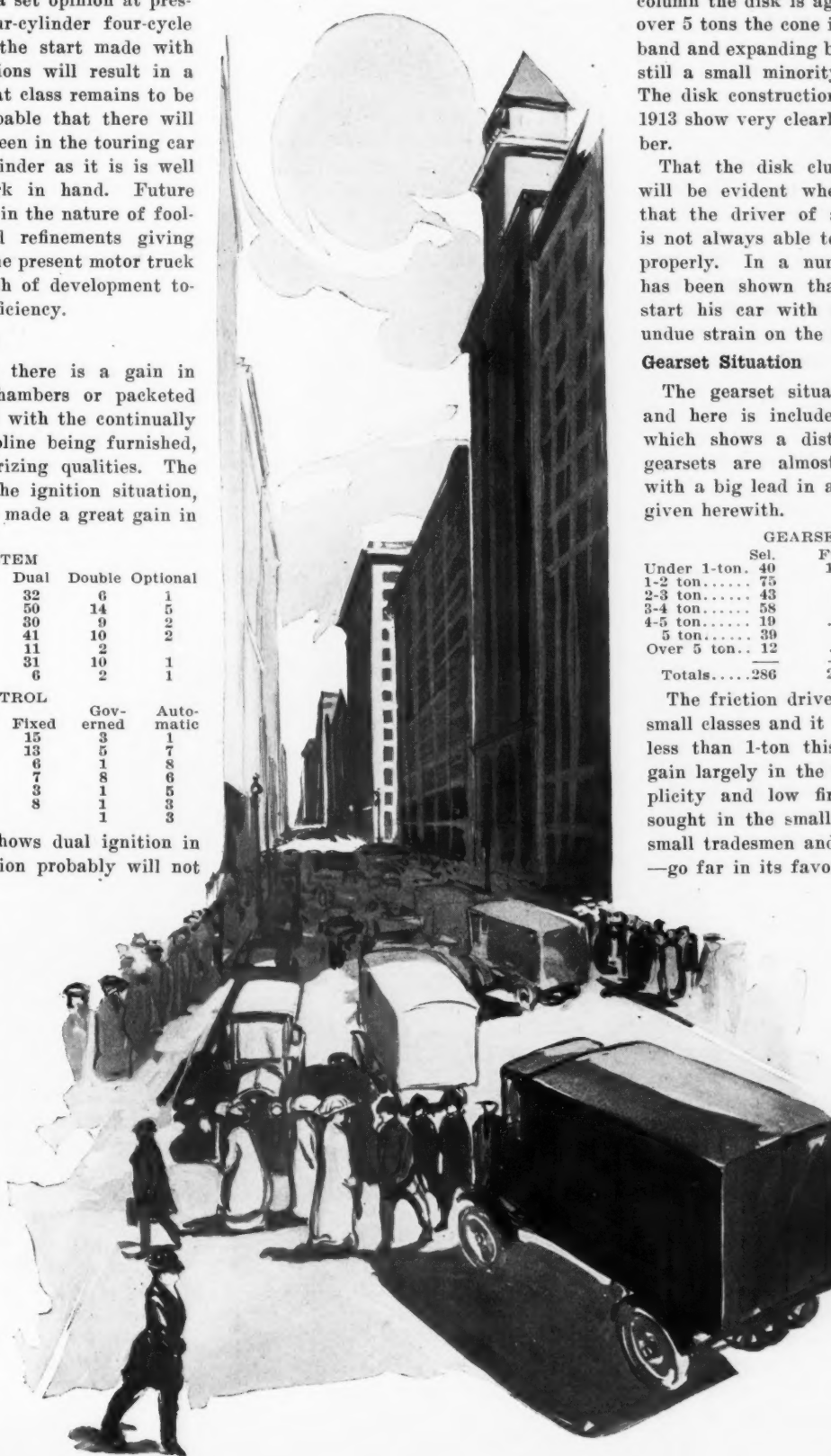
The gearset situation is shown below and here is included the friction drive, which shows a distinct gain. Selective gearsets are almost standard, however, with a big lead in all sizes. The table is given herewith.

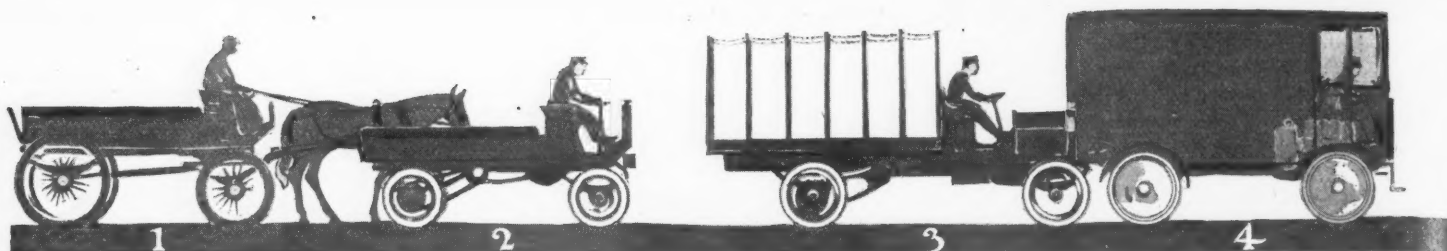
	GEARSET TYPES				
	Sel.	Fric.	Plan.	Prog.	I. C.
Under 1-ton..	40	12	26		1
1-2 ton.....	75	5	7	3	8
2-3 ton.....	43	3		2	3
3-4 ton.....	58	1		3	4
4-5 ton.....	19			1	
5 ton.....	39	1		5	
Over 5 ton..	12				
Totals.....	286	22	33	14	16

The friction drive gain has been in the small classes and it is possible that in the less than 1-ton this form of drive may gain largely in the near future. Its simplicity and low first cost—ideas to be sought in the small vehicles which go to small tradesmen and hence must be cheap—go far in its favor, and where size does

not demand too wide a friction where the wheels need not be large enough to throw severe strains on the frame this drive gives excellent service. In the larger vehicles the friction gear is dying out. A combination of direct drive on high and friction for low gives great promise.

The problem of final drive to the rear wheels is receiving attention and obtaining recognition in the different branches





The above illustrations show concisely some of the early developments in the motor truck field and also some of the present types of construction. types of horseless wagons with bad balance and other faults such as noise, costly because of its speed, dirty and with no protection to the driver. Fig. 3 in sand and mud. Fig. 4 illustrates the gasoline electric driven by two or four wheels, while Fig. 5 shows a machine with tractor-wheels and but which has a short turning radius, an advantage in alley and city work. The first two are early vehicles, those following being modern types and

as is noted in the table which is shown herewith:

	FINAL DRIVE				Ext. G.
	Chain	Bevel	Worm	Int. G.	
Under 1 ton.....	51	26	1	1	1
1-2 ton.....	78	14	3	3	1
2-3 ton.....	47	4	2	2	1
3-4 ton.....	65	1	2	1	1
4-5 ton.....	16	..	..	1	1
5 ton.....	42	2	1	..	1
Over 5 ton.....	12	..	..	..	1
Totals.....	311	47	7	8	2

Drive by side-chains has the preference, with bevel-drive a far-off second in the small types and further off in the large sizes. Worm drive is still at about the same figure as last year, but experimentally in the different plants much has been accomplished toward the early production of more worm drive constructions.

This final drive is probably the part of the modern truck least developed—that is, furthest from the final type. Here is where the most thought is needed and the most ingenuity in bringing out a drive that will overcome the objections of the recent prevailing types. If the worm can be perfected with low axle weight there is great promise in it. It is more than making good at present where the worms are correctly made and installed. So much for the present transmission systems.

#### Right and Left-Hand Steering

Another point of present contention is between right or left-hand steering and the control lever positions, as shown below:

	STEERING WHEEL LOCATION.		
	Right	Left	Optional
1 T or under.....	47	26	1
1-2 T.....	63	28	1
2-3 T.....	34	17	1
3-4 T.....	43	16	1
4-5 T.....	12	5	..
5 T.....	30	10	..
Over 5 T.....	7	1	..
Totals.....	236	103	3

The right-hand location of the steering wheel is shown to be in the lead with the left drive second and a few listed as optional. This optional column will probably grow during the next year, followed by a greater gain in the left steer location. Whether levers will be at the center or at the left is a question, since on a truck the driver must get off at the right for quick work. Where he works with a helper in package work the left-hand drive is a big advantage, but for work where the driver handles his own delivery there still is a question. Both types may survive.

The tire table herewith lists the average sizes of tires for motor trucks of different capacities. The comparative contradiction of the different sizes might require some

answering by the makers. For instance, why are front tires on the over-5-ton vehicles smaller than on the 5-ton machines? It is probable that at this point makers find the steering problem serious and lighten up on front axle weight to ease off the work of the driver. Should this be an item in other classes? The rear tires are the same size in these two divisions.

Motor Truck Sizes	Average Front Tire Sizes	Average Rear Tire Sizes
	Front	Rear
Under 1 ton.....	34 by 3	34 by 3
1 to 2 ton.....	34 by 3½	36 by 4
2-3 ton.....	35 by 4	36 by 4
3-4 ton.....	37 by 5	37 by 4
4-5 ton.....	38 by 6	38 by 5
5 ton.....	37 by 6	40 by 6
Over 5 tons.....	36 by 6	40 by 6

As to other items springs are generally longer, with wider leaves and more of them and better material is being used, giving much easier riding and taking much of the road jar off the vehicle. Body design is a thing in itself and is discussed elsewhere.

#### Studying Requirements

It is a significant thing that buyers are beginning to overlook the mechanical details of a motor truck, taking much for granted in this line and spending more of their time and effort to determine which chassis or arrangement of mechanism will best fit into their business. They are considering it more important that a truck be of a size to fit their body requirements than whether the motor is of the block type or with cylinders cast in pairs. The fact that the height of chassis fits the delivery platform requirements at the store is of greater moment than whether the car has fixed or hand-controlled ignition.

This leads to the query as to whether we have reached the final type of motor truck, since trade conditions are so im-

portant, and whether the final evolution of things will not bring out a radical design, just as when the steam locomotive had been developed to its limit along the lines first laid out by Stephenson and others, a radical jump was made to the electric locomotive. This does not mean the the next radical change may be to electric trucks, probably not, but that the final truck may be as different from present ones as the electric locomotive from a steam mogul.

While the present type of motor truck is approaching a high state of development it cannot be said of a surety that the final design has been reached. Outcroppings here and there of more or less radical ideas presage a period of yet farther development of commercial motor vehicles along radical lines. That many of the newer ideas and radical designs are doing exceptional work along certain lines only makes the likelihood more sure that the final design of motor truck may be something widely different from present machines.

#### Developing the Truck

It is admitted that the present motor truck, while making good in every sense of the word, has certain drawbacks and fails to meet conditions in many branches of its work, as would be possible were some slight changes made in the ideas of its design. This comes largely from the method in which the motor truck was "developed."

To the layman the word "developed" has but a vague meaning when applied to a mechanical product, but every successful machine before it has arrived at a standard type has passed through a period of experimentation; a process of building, trying out and rebuilding, by this firm and that until the weak points of design have been eliminated and the best ideas collected into one machine, this being the final "developed" product. It is the costly result of a first idea.

The wagon itself, for instance, was developed from the crude log rollers of the stone age, perhaps through hundreds of years, until the modern form of wagon was reached as a final design. The first motor cars were crude horseless-carriages with single-cylinder motors. As they were built in numbers and put in the hands of users with little motor knowledge, de-

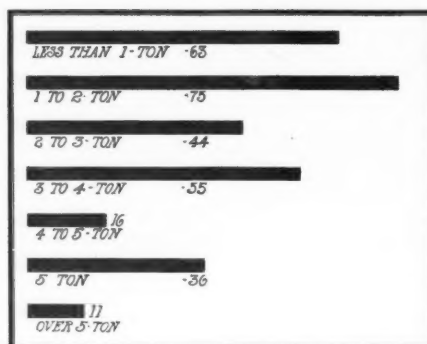


CHART 1—COMPARATIVE NUMBER OF TRUCK MAKES IN DIFFERENT SIZES



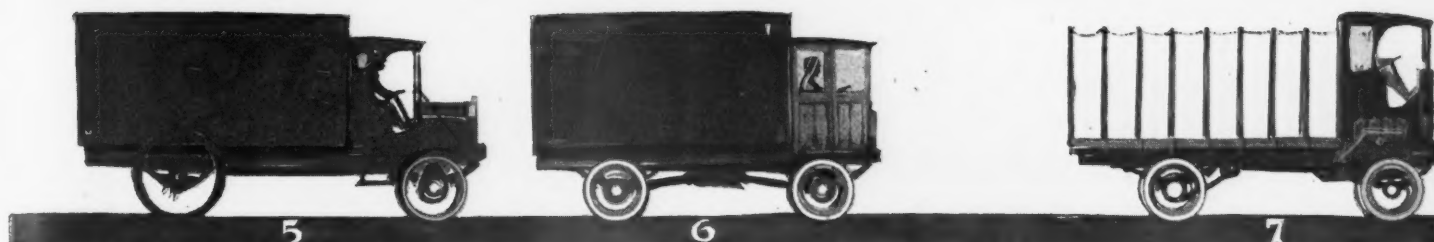


Fig. 1 is that of a horse-drawn vehicle which shows how poorly protected from the weather is the driver. Fig. 2 is an illustration of one of the earlier is a modern type of motor truck with the tractive weight on the rear wheels, long wheelbase and long turning radius, greatly handicapped traction. Fig. 6 is a four-wheel-drive type which gives good traction and equal load distribution. Fig. 7 is a machine of short wheelbase, promising constructions

facts developed which were remedied, certain forms found favor with buyers, and the result, after years of work, led to four and finally many six-cylinder cars of today, far different from buggies or carriages and well fitted to the new motor conditions. Even in the pleasure car branch of motoring there still are radical changes expected before the final type of vehicle is reached.

With the motor truck the first steps were in copy of the pleasure car. Some firms took their older type pleasure-car motors and attempted to fit them to hauling freight. Others took touring cars and fitted solid tires, thus changing them to motor trucks, while others attempted new designs, but adopting ideas old and given up in the pleasure car branch. Many of these have fallen out, but many saw errors early enough to change designs and really build a vehicle adapted to the hauling of heavy merchandise.

#### Early Trucks Too Fast

In the early days makers of 3-ton trucks bragged that their machines could do 30 miles an hour when they had to—and they could. The users who attempted these speeds—and there were many—found that the cost of running a truck was enormous and many gave them up. The makers wondered why, until it finally became established that to keep upkeep expense low the speed must be kept down. When this idea got hold the truck began to make a showing.

The tires on early vehicles were small, too small, and were made larger until duals became almost standard for the rear. Rear axles were weak, and were strengthened. Chain sprockets were too small and caused much chain wear and noise. These were made as they should be. Body design was poor and ill fitted to the work in hand. This was made a special study. Drivers were furnished with protection that they might work more efficiently, and unloading devices, such as dump bodies, were made to decrease their work. Steering was made easier, and the controls more efficient. The speed was taken from the driver's hands and regulated by a governor. First types of governors were quickly put out of commission by the driver tying them up or wedging the control wires, but the final governors were enclosed and locked away from the driver's ken.

Thus the motor truck has developed or reached out toward perfection, but the last steps are not yet taken.

Many ideas adopted in the past have been dropped, many have stayed and been adopted by all makers. Others about hold their own.

#### Shaft Drive on Small Cars

The position of the levers and steering wheel is still in the stage of development and has not arrived to a final point of perfection. The drive to the rear wheels also is another zone of contention, each manufacturer claiming advantages for his system.

On small cars shaft drive is used and this has the advantage of being entirely inclosed, clean and noiseless. On big trucks, however, the gear ratio of reduction at the back necessitates a large gear and hence a large housing, all making for extra axle weight. The amount of unsprung weight on the rear axle has much to do with tire wear. To get this some makers interpose a spur gear reduction between the bevel and axle or bevel and rear wheels, but the most common method, as shown before, is to reduce by chain from a jackshaft. Chain drives, admittedly faulty, are being bettered, and gear drives and worm drives are being perfected. Each has its adherents, its advantages and

disadvantages, which will not be discussed to length here, but enough has been said to prove that along this line of final transmission of power to the wheels a finality has not been reached, nor a real trend shown.

To get around chain noise and trouble chain cases were made by a number of firms and a great future predicted for them, but so far no great gain in the number using these devices has been made, many preferring the replacement of the chains and sprockets every so often to the extra expense of the case and bother of getting at the chains and parts in case of chain failure or wear.

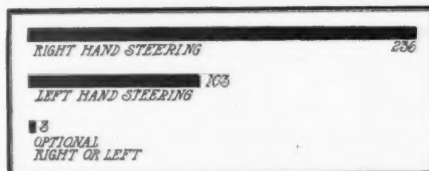
There has been difficulty in making the cases stay tight also, and a ball joint at the front to take up the twisting strains has not always been sufficient, as the side sway of the springs when rounding corners at speed throws an enormous side strain on the case itself at the rear, necessitating either a very strong bearing at the rear end or a second ball joint.

#### Progress of Worm Drive

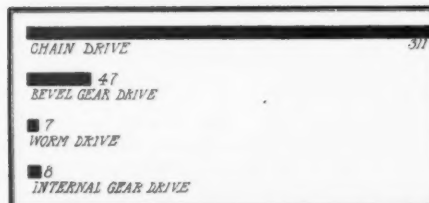
Worm drive, as shown by later figures, does not seem to have made a gain in this country during the past year, as shown by the figures of actual vehicles, but this is due to manufacturing reasons rather than others. Few American firms are equipped for making proper worms and some that are have not known how to make them for this special work. The past year has brought great development in the factories so that an increase may be looked for as the plants themselves develop.

At present chain drive is in first place, with indications that it will continue to be so for some time. There are other systems admittedly better if one is willing to pay, but the chain final drive is now much in preference. The trend, if any, is toward some new form of drive, as evidenced by the amount of experimenting going on, not the least being the later hydraulic and gasoline-electric systems.

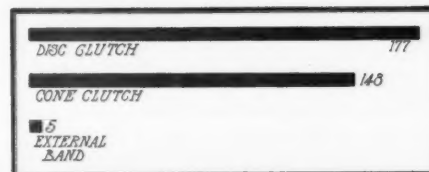
This briefly follows what is meant by the "development" of the modern motor truck as viewed by an engineer. The original idea of a motor truck as a motor pleasure car developed for the road hauling of merchandise has progressed far but is not the only line which should be studied. There are others worth looking at and trying out.



COMPARISON OF STEERING GEAR LOCATION



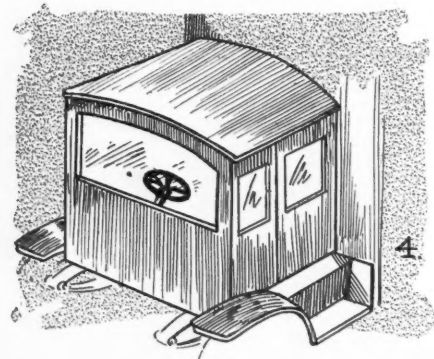
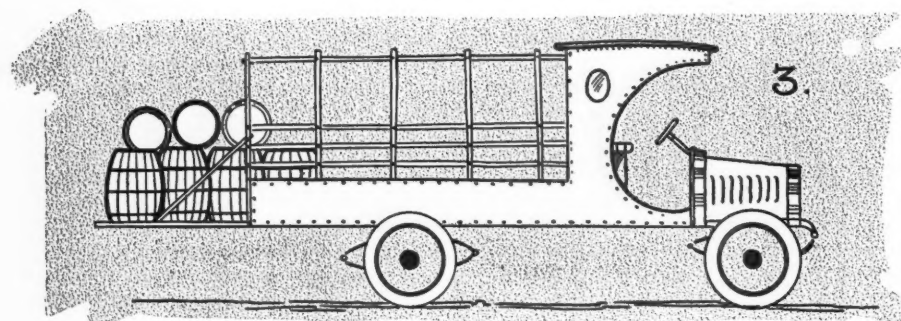
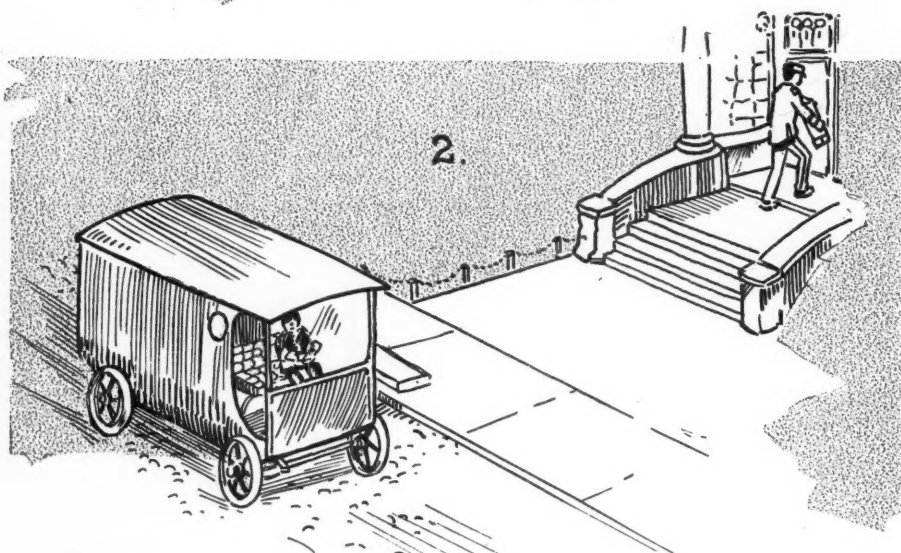
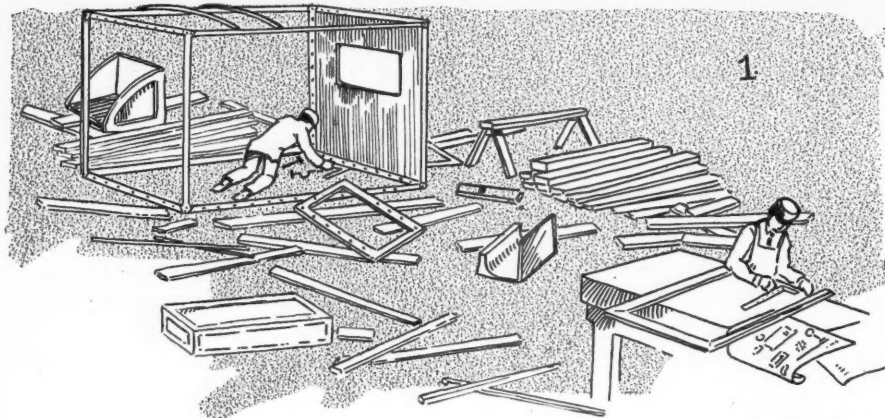
COMPARISON OF FINAL DRIVE



CLUTCH TYPE COMPARISONS



# Body Arrangement Important



FOUR BRANCHES TO BE CONSIDERED IN  
BODY DESIGN—1—FACTORY; 2—ROAD  
SURFACE; 3—CHASSIS DESIGN  
AND OVERLOAD; 4—THE  
DRIVER

**D**ESIGNING bodies for motor trucks is an art in itself and because of the peculiar conditions existing in this branch of the industry one finds that body designs naturally are departmentized and in sketching out his ideas the designer must consider, first, manufacturing conditions; second, road and service conditions; third, chassis design conditions, and, fourth, the needs of the drivers.

Many motor trucks in the past have proved failures on account of faulty body design and many who have attempted to design truck bodies for their own use have been disappointed in the result.

Much of the lost time on delivery is due in many cases to a former lack of understanding of the body builder as to the conditions of service in which the truck would work.

## Faulty Design Causes Accidents

Faulty design hindering the view of drivers leads to many accidents, while efficiency often is lost through the discomforts suffered by the driver in cold and stormy weather, or on account of an uncomfortable seat.

The factories demand designs from which they can work or prefer to make up the designs themselves. No man unfamiliar with body building can successfully design a truck body.

Users demand from the factories bodies which are fitted to their service conditions. No factory can design truck bodies from a mere basis of wood and iron construction.

Makers demand from the body makers and users bodies which do not strain the chassis, or lead to improper loading. Tire men join in condemning too heavy bodies and improper hanging, which will throw destructive weights onto the tires.

## Should Remember the Driver

Drivers are asking for more protection from weather and better ways of seeing in all directions as a protection against accident. No driver who is uncomfortable or suffering hardship of any kind can work at his best or keep in even temper.

Before building a body the maker studies service conditions so that it might be well to glance at some of the various conditions the vehicle will meet with in service before talking the manufacturing end.

The design of motor vehicle bodies is an entirely new line and to be best handled by specialists who have had previous experience and who will not jump at mere conclusions but ask for facts and figures giving details of the work the truck will have to do; what kind of loads

# Phase of Motor Truck Design

it will haul, how it will be loaded and, if there is a better way available, this will be suggested and the body made to conform to the loading requirements.

The length of hauls will be considered and especially the conditions of delivery. Every item of service will be a basis of figuring so that the body design shall fit the conditions it has to meet.

These conditions determined the chassis will be examined. If the machine is already purchased it will be necessary to fit the body to that particular frame, if not suggestions may be made toward the purchase of a machine which can best be fitted with the best shaped body.

## Low Frame Sometimes Wanted

For instance, in a certain line of work deliveries may all be to the sidewalk, and the loading done in such a way that the height of the body floor makes little difference. In this case it may be desirable to have the floor of the machine as low as possible and a vehicle chassis with a low frame will be recommended to save useless lifting in unloading and undue breakage in dropping the load to sidewalks.

Again a chassis with a low frame may have been purchased and the buyer intends to use the machine for a bulk load such as sand, coal or salt. If he is to use a dump body the floor will have to be at a height sufficient to keep the tail-board of the body off the ground when dumped at the steepest angle, but if the body is to be discharged by a chute the load will need to be carried high. This may mean the blocking up of the body for a foot above the frame. In this case a chassis with a higher frame might be an advantage.

In package work some routes require a small, swift vehicle such as a light gasoline car, others a slow electric, and others a large fast car. Some on congested routes will need space for two helpers and others on scattered work may need none.

## Loading in Coal work

In coal work on short hauls the loading and unloading is of first importance, in other places with 6 to 8-mile hauls this takes secondary place. Each must fit its own conditions.

If a machine is to be used to haul 5-ton loads on long hauls little attention will need to be given to the refinements leading to quick loading and unloading, but great care will have to be taken to see that the body is made strong enough to stand the continual vibration and strains on the road that are subjected by

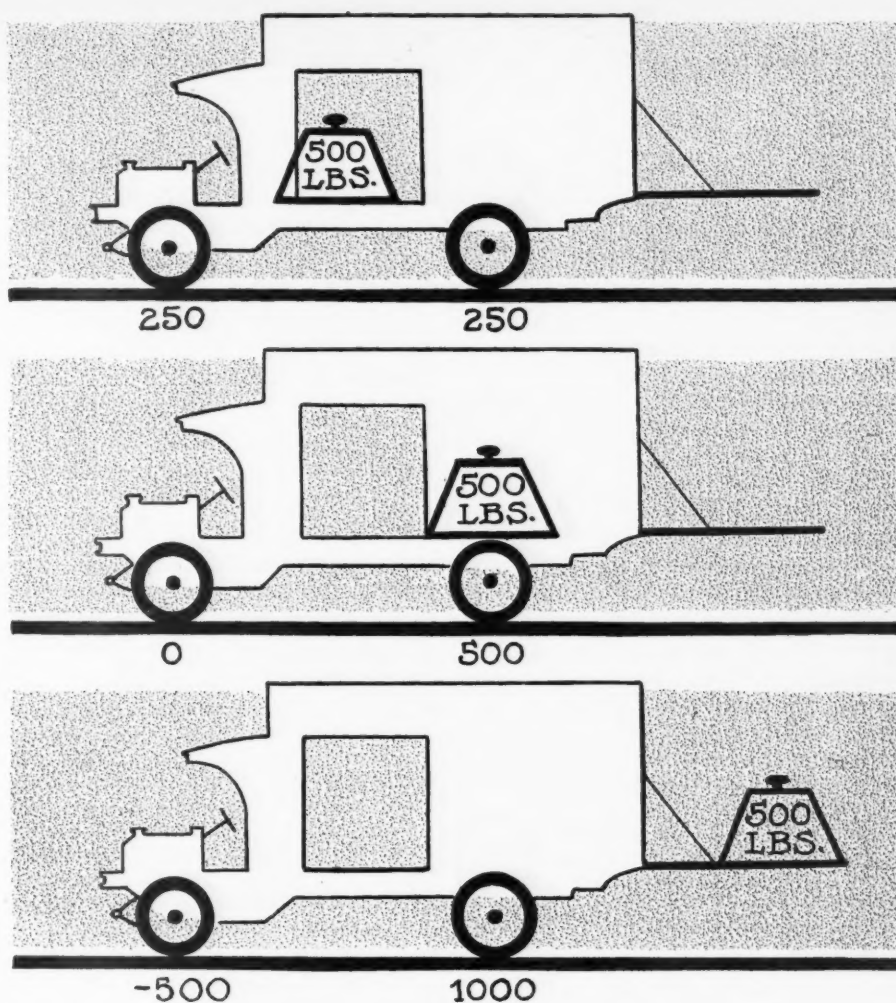


Fig. 1—Showing relation of weight position to amount of load

the kind of load hauled. Five tons of brick are a great deal harder on a motor truck than 5 tons of hay, as the brick is a solid dead load with no spring to it, while the hay will cushion its action on the vehicle and body by its own springness. The body must fit the load.

If the truck is to be used over highly cambered roads more clearance will need to be allowed over the rear wheels, though some makers fit an extra leaf in the spring on the low side. The writer noticed a 5-ton truck recently loaded with cement running near the curb of a highly cambered street, the load from the tipping throwing the weight to the right side of the body until the floor rubbed on the tire beneath. This had gone on for sometime for the board above was very nearly worn through, to say nothing of the condition of the tires.

The making of motor truck bodies has become a business in itself, and those

wagon makers who have had the foresight to provide equipment so that they can turn out correctly designed commercial motor vehicle bodies quickly are

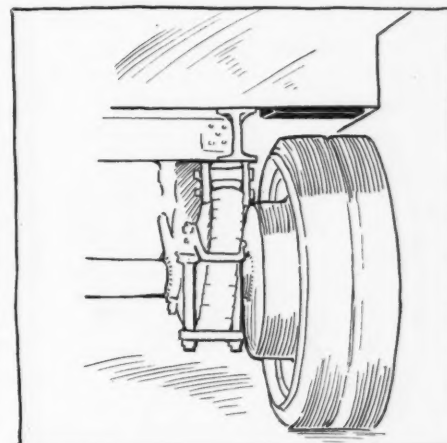


Fig. 2—Showing necessary clearance between tire and body



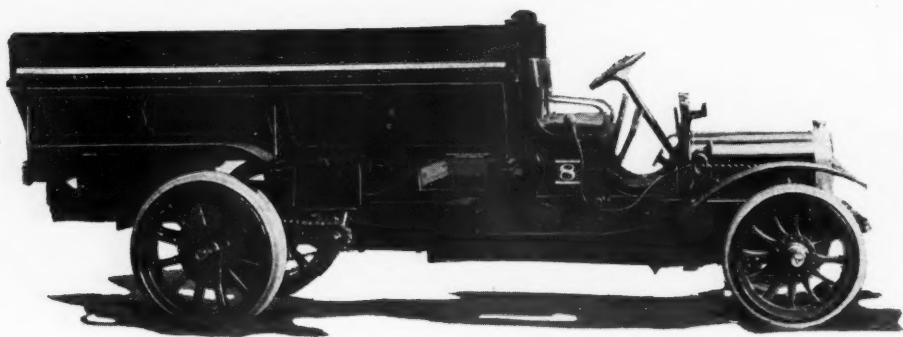


Fig. 3—Coal body for city work in hauling steam coal

reaping the reward as the motor truck gains in numbers.

This brings up one to the manufacturing difference between the making of motor wagon bodies as compared with horse-drawn vehicles. The owner of a horse outfit can order a wagon body today and wait for the maker to get it out in his own time, as it is no particular expense to have the wagon idle—the horses are working just the same.

With the motor truck idle in the body shop there is not only a waste of service possibilities, which might mean a gain of \$10 or \$12 per day to the owner, but there is an actual loss of several dollars through having so expensive a machine standing idle, through interest, insurance, etc.

#### Building the Body

It is hardly satisfactory to manufacture a body for a big truck, as the chassis designs vary so largely, and changes must be made to fit every frame. The body must be built, an individual job on individual measurements. This is more or less of a slow process but by modern machine methods can be shortened to a much less period of time than is usual on a wagon job.

This individual building requires ordinarily that the truck chassis be in the wagon shop so that the body can be built alongside and fitted to it. Since the machine is idle during the body-building period, owners are naturally in a hurry for motor truck body jobs.

To illustrate items of difference in conditions of building, trucks coming into the body shop differ in frame line. One chassis has the frame 6 inches below the tire tops at the rear, necessitating the building up of a framework on the chassis to set the body upon before the body proper is fitted. Others have the frame high

up so little under-filling is necessary to make the body clear. It must be remembered that there must be 6 inches clearance between the tires of the rear wheels and the underside of the body floor above to allow for spring action.

Again most trucks without bodies come with the rear end of the frame higher than the front, often as much as 4 inches. In fitting the body this must be taken care of to keep the load from working forwards on the body floor on rough roads. This often means that the forward end of the body is blocked up several inches higher than the rear end.

All of this may necessitate individual measurements of every car and working on the frame direct. That a special body must be built piece by piece is the chief reason for high truck body cost.

Once in a long while a firm will put in a fleet of trucks and then may order a number of bodies of the same design. In this case manufacturing is possible and the cost per job lessened to that degree.

The whole question of body design and manufacture is an interesting one from whatever standpoint it is viewed. The body manufacturer of course has his ideas on construction, the business man on service in delivery, the maker wants the body to put the least strain consistent on the chassis and the tire man makes vociferous clamor against designs of bodies which throw overload strains on the tires. The last man to speak is the driver, who wants comfort in all weathers and handy controls. For safety it is imperative that he be able to see in all directions.

#### Four Departments Evolved

Thus the study of body design evolves a type fitting these four departments of body work and use: Factory, road service, manufacturers design of chassis, and the driving.

A part of the factory standpoint of body design has been touched upon. It would be as wrong of course to send to a woodworker for a steel body as it would to send to a steel firm for a wooden body. Each design must conform to the shop facilities available for its building. A man or shop which has had only wagon experience may fail the first time on making a substantial motor truck body, though after a few trials he can develop his work to the new line, but if he depends on workmanship alone he will fail.

It is usually left to the body maker very largely to design the body that is to be fitted, sometimes after rough pencil ideas have been handed in.

It is then up to the body maker to evolve the finished plan. To do this intelligently he must inquire into the line of work in which the machine will be used as just described, learn what are the important things in the delivery work, whether stops are few or many and the height of loading platforms, etc., etc. When he has an idea of how the machine is to be used he will know better what to make and how to perfect the original pencil sketches or spoken ideas.

Before starting work it may be that the body designer must consult with the truck maker who limits his guarantee perhaps to a properly bodied machine, and the man ordering the body wants to be sure and get the guarantee without question.

The sketches then are passed upon by the maker of the chassis. If he sees that there is too large a body fitted, or if there is too much overhang, he can give warning. His guarantee only holds if the loading does not exceed the rating. With an established truck body man the factory might take for granted the work from his factory or shop. Ordinarily, however, manufacturers gain by keeping an eye on the bodies fitted to their machines.

#### Tire Makers Interested

But even now all is not done for the tire man is interested. He has little say as a rule but the body designer in taking care not to overload the rear axle generally sees at the same time that the tire load is not too great.

The body must be designed to throw the least weight possible on the tires, not only by its own weight but by the distribution of the load. The average van, for instance, would be better designed if side doors always were fitted, as if they are not handy few teamsters or loaders will bother to put a small load to the front of the body but will leave it on or near the tailgate, throwing the bulk of the load on the rear tires and axle. A 500-pound weight on the tailgate may mean a 1000-pound weight on the tires! This is shown in Fig 1 in diagram, the weight of the vehicle itself being ignored, for purposes of illustration.

The top diagram shows the load of say, 500 pounds put on the body between the wheels of the truck midway. In this fig-

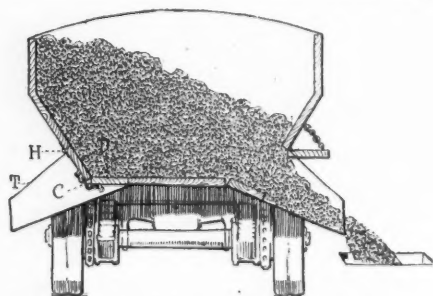


Fig. 4.—Side coal chute used on fuel trucks

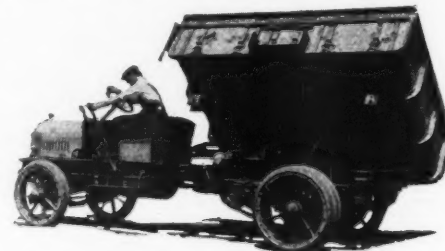


Fig. 5—Side dump body, showing mechanism





Fig. 6—Lumber body with roller dumping scheme

ure the load of the weight shown is equally distributed between the tires, 250 pounds front and 250 rear. In the second diagram the weight is further back—more an average case—with the load directly over the rear wheels. This throws the full 500 pounds on the rear tires, the front tires only carrying the weight of the vehicle.

The lower drawing shows the weight on the tailgate set out the wheelbase length from the rear axle. The leverage is two to one so the weight on the rear tires caused by this 500 pounds is 1000 pounds while 500 pounds of weight is taken off the front wheels because of the construction.

This case is extreme and yet a very close approximation to it was seen recently on a body of about the proportions shown in the sketches where two pianos were loaded overhanging the tailgate of the van with no load in front. These two pianos in this location threw as much weight on the rear tires and axle as if six pianos had been properly loaded in the body.

This truck may be standing up with this sort of loads,—it was easy to see that the tires were not—but if so there is a lot of extra and unnecessary weight on the rear axle of that truck that is being carried around by other firms using this same make who do not abuse the rear axle by improper loading and body design.

#### Worthy of Consideration

The height of the floor over tires has a very distinct bearing on body design as shown in Fig. 2. This distance possibly might be used by the manufacturer in furnishing bodies to absolutely prevent overloading, but then the tire makers might object as when the machine was overloaded the tire would get the blame and not the truck. At least 6 inches should be left between the body and tire, as an average figure. Other points of service conditions required have been explained.

Last but not least the driver must be considered. A driver who sits all day on an uncomfortable seat, or a helper who sits on a seat with no back, is tired out by the end of the day even if he do no other work.

A driver sitting all day in the cold of an unprotected cab or even working in a temperature where he must bundle up warm is at a disadvantage. He cannot be as efficient as if he were in a warmed cab. His attitude toward the work will be largely the result of the discomfort that it brings to him. For efficiency's sake the driver must be taken care of in the matter of protecting him from the inclemency of the weather. This should be given consideration.

Several times while riding on motor trucks and vans the writer has noticed the great disadvantage the driver is put to who cannot see in all directions from his driving seat.

Some van bodies are built with almost no provision for looking to the rear. On these there should be at least a mirror fitted so that the driver gets a reflection of what comes up from behind. As motor trucks increase in number this item of clear vision will be increasingly important.

As showing what all these influences have already produced in the way of bodies a number of types already in use are shown in the half-tone illustrations, some more successful than others but each pointing to desirable and undesirable features. In gauging their good points the items of service must be kept in mind

and the list below gives the ordinary main requirements of service in different lines, selected at random and for average conditions:

Coal .....	Loading and unloading.
Lumber .....	Loading.
Package work .....	Short stops to deliver speed, quick starting and stopping. Space for helpers. Routing of load.
Bus work, city .....	Speed and quick start and stop. Low frame chassis. Short turning radius. View in all directions.
Bus work, inter-city .....	Speed, capacity, reliability.
Van work .....	Proper loading, handy loading arrangement.
Building material .....	Short turning radius. Capacity in tons. Unloading facilities.
Box and barrels .....	Body capacity cubic Quick load and unload.
Packing and meats .....	Weight capacity, easy handling, speed.
Fire apparatus .....	Speed, extra control, noise capacity.
Oil .....	Fireproof weight capacity, non-shifting of load, time of stops.
Parcels post .....	Short stops, correct routing of load.
Rural delivery .....	Speed, reliability, lightness, ease of road repair.
Mining .....	Reliability, hill climbing ability, power, steel wheels.
Contract hauling .....	Adaptable bodies, etc.
Newspapers .....	Speed, reliability.

Taking some of these classes the illustrations show the trends in body practice and with the discussion of each type ideas may be brought out which will fit other conditions not met with by these machines. Fig. 3 shows the coal body used by the City Fuel Co., of Chicago, and built by the Jacob Press Sons Co.

#### Selecting Proper Body

In selecting this type of body various service tests were run with all kinds of dump bodies and the like. It was found impossible to dump the ordinary damp, soft coal so that the motor vehicles haul the screenings only—steam coal in full load lots. There are no divided loads and the machines do not deliver house-to-house.

Most of their work is on less than 2-mile hauls so that loading and unloading is important. The coal holes of the district are small, however, and hard to get at. As a result there is quite a percentage that the dump body truck can not



Fig. 7—Truck with trailer for construction work

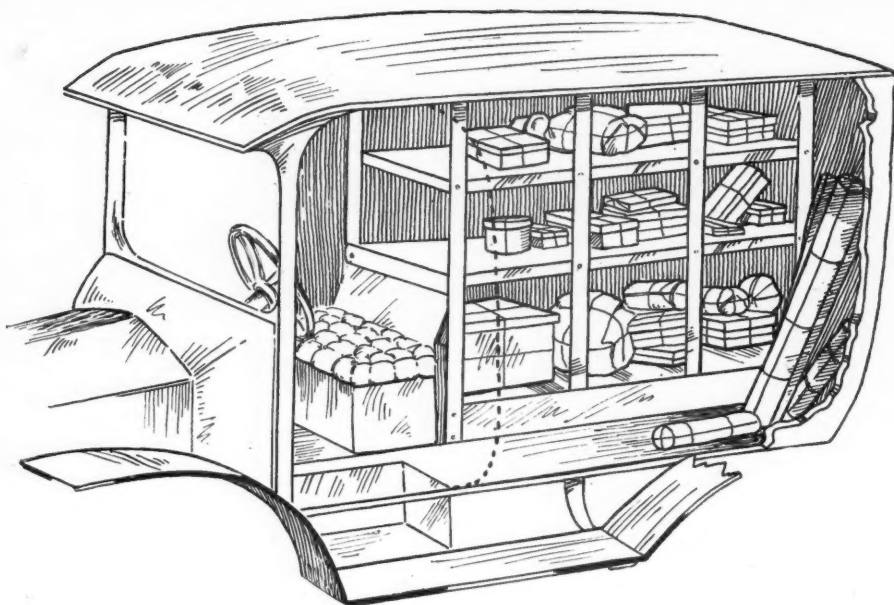


Fig. 12—Shelf body for light bundles in congested districts where helpers are required

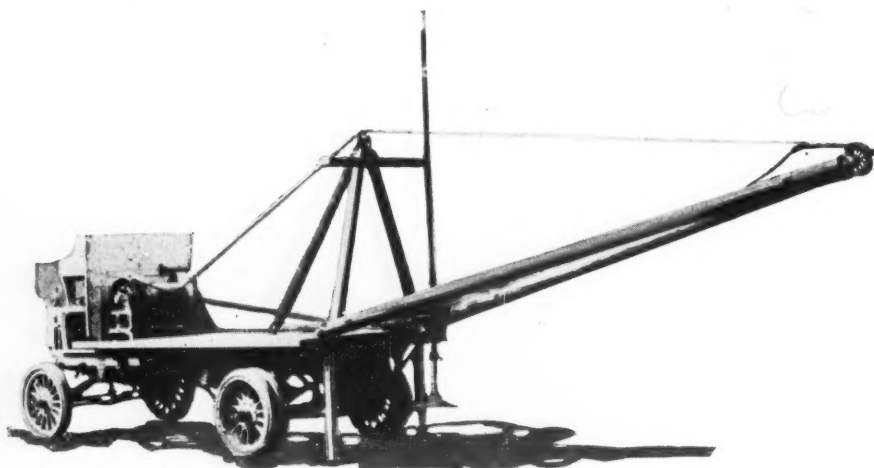


Fig. 8—Truck equipped with power winch

serve except by shoveling. The slope-sided non-dump body was thus adopted with facilities for putting the load almost anywhere with a little shoveling.

In the first place there is a door in the floor at the center which can be dropped at accessible places where the machine can get directly over the coal hole. Next there are four side openings, one in front and one back of the rear wheel on either side. The one at the front is directly over the chains which might be counted an objection from the coal dust standpoint but can hardly be prevented.

#### Aiding the Coal Dealer

Forward of the front chute is a space for storing the removable chute during transit. There also is provision for discharging at the rear, through a door in the tail gate or by taking it down. The machines are well fitted with mud guards and their cleanly appearance makes one wonder if coal can be as dirty a thing as it has been reputed to be.

It takes from 4 to 12 minutes for the driver to shovel off the load through the floor openings which is no more than

taken by some of the better types of dump bodies on average work. The small

sketch, Fig. 4, shows the way the side doors open up to let the coal out through the chutes.

The doors are shown here at D, hinged at H, and with a catch at C. On releasing this catch the door on the bottom drops into the chute and the other is lifted up and can be fastened by a length of chain as shown. This leaves the opening free for the coal to flow out through the chute.

The ordinary dump body is well known and does not need to be illustrated. This type is of great advantage where the unloading spaces and conditions allow of its use but there are many places where a dump body cannot be used where it dumps to the rear only.

#### Uses of the Dump Body

Fig. 5 shows a White heavy-service truck that can be dumped to either side, having that added advantage over the straight dump body. The body is of steel in this case and supported on the chassis on four points. The body is lifted by the power of the motor through the frame seen at the center of the bottom, connected to the chain running forward to a winch.

When this central frame raises the body it dumps to either side depending on which two of the four supporting points are unfastened. Draw clips from one side and the body pivots on the other. The coal is discharged by side chutes shown.

If slight changes were made it would be possible to dump this body to the rear as well, loosening the two forward points of support and pivoting on the two rear ones, a rear chute or door being provided. It would be impossible to use a body of this kind in the City Fuel Co.'s work in Chicago, but in other cases it might suit better than any other type of body. The steel construction is worth noticing on this box.

The greatest problem of the motor vehicle in coal work is the branch of house-

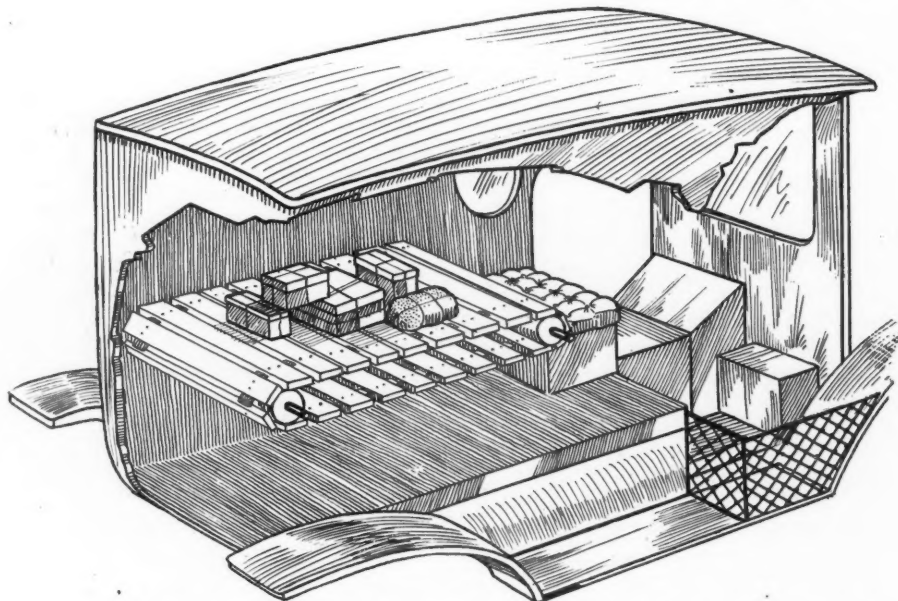


Fig. 11—Slatted belt device for bringing packages forward, with space at footboard for outgoing packages, which are accessibly located



to-house delivery. In this class of work the unloading conditions are so varied that no type of body yet developed can serve all of the requirements, and in many cities cannot come near enough to the requirements at the present time to be considered for this work.

Chicago coal dealers, many of them, doubt if the horse ever will be superseded in this branch of work. In New York the possibilities are better and some machines are in use delivering to houses and making good.

Take the Chicago conditions for example. This city is flat and there are no hills. The city is covered by a network of railways with the best of trackage facilities so that coal is delivered to yards over the entire city spaced at intervals which mean an average haul from any one of them of not over  $1\frac{1}{2}$  mile. On a haul as short as this the horse truck has a big advantage, the motor vehicle being able to show but a small gain of time over the horse in this distance, so that here especially the amount of time the truck can be kept on the move with load is important.

This means that the loading and unloading time is of first importance in assisting the motor truck to make as many trips a day as possible. The loading can be accomplished in from 7 to 12 minutes by crane or similar method, but the unloading at the houses is a problem. For houses a mile away the truck might be made to pay, but for the nearer hauls which constitute the greater part of the work, the problem is serious.

#### Some Delivery Problems

Take the flat construction for instance. Most of these are loaded through a front basement window over a narrow strip of lawn. To get the coal in it must be wheeled or carried from the street, over a grassed boulevard, across the cement sidewalk, over the final grass strip of front lawn and there dumped into a window in the side of the wall. Few flats have the coal opening in the sidewalk or alley, or are fitted so that the coal vehicle can get anywhere near them for dumping. The distance is too great to be handled by chute.

With horse equipment the load is dumped in the street and men with wheelbarrows, laying plank runways over grass and sidewalk, wheel the coal in from its dumping place. The wagon waits and

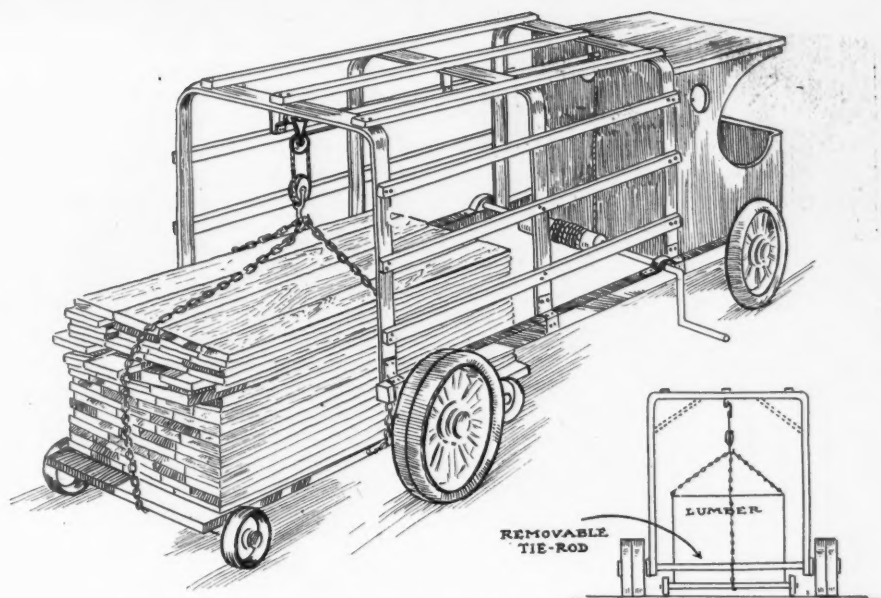
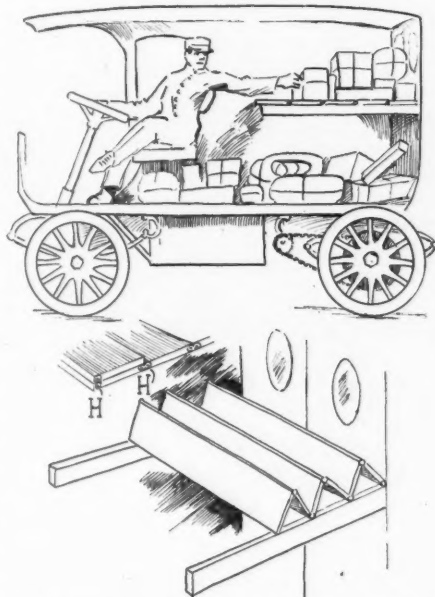


Fig. 10—Suggested idea for lumber hauling, eliminating rehandling of material

when the load is in carries the men and barrows back to the yard. On some occasions the wagons leave the men at the unloading to call for them later. This system might be developed to fit the mo-



Shelf for package van which can be folded out of the way

tor vehicle by having an extra small car to pick up the men and barrows.

It might be possible, however, to build and perfect a belt-conveyor system which

could deliver the coal direct from the wagon, the power of the car motor driving the belt through flexible shafting or the like. It would be easily possible to convey the coal around a corner and to more or less inaccessible places, but would need to be easily stored, quickly put into place and operation and quickly taken down, while it would need to be simple and foolproof enough so that the driver could handle it without need for a special man to help him.

#### Crane in Delivery Work

Another scheme might be used in the yards. Some of the firms—the City Fuel Co. of Chicago, for instance,—use a crane on a railway car for loading the trucks and wagons. If the track is filled ahead there is a wait by the empty vehicles in line, while the crane car can get over the track to the special pile of coal where the next wagon is to be loaded. For this work a crane might be fixed on a heavy truck body, this crane being able to dodge about all over the yard from pile to pile, loading this truck and that as called for. The body and mechanical construction would be no hard job for a good designer, and in many cases the truck, not having to follow rails, could make a great saving of time over the railway crane.

The average load of coal drawn by teams in Chicago is 5 tons, but three horse teams with 6-ton loads and over are common. This is due to the level streets and means that in this city motor trucks compete with horses on a nearly direct mileage basis.

In cities like Pittsburgh, St. Paul and Kansas City where hills abound the horse loads are about half of this figure, so that the motor truck which laughs at hills with a 5-ton load needs to make only half the mileage required of it in Chicago to make an equal showing.

Coal hauling is an important branch of heavy traffic and should be one of the first to adopt motor trucks as standards,



Fig. 9—Steam vehicle for hauling steel girders





Fig. 14—Pie wagon body with center aisle

but systems and bodies and mechanisms to fit conditions must first be perfected to give maximum results.

The lumber trade presents an entirely different set of problems, the only things in common perhaps being dictated by local conditions such as size of horse load, hill conditions, distance from shipping points, etc.

#### Saving Valuable Minutes

The loads as a rule are heavy, the stops few and unloading conditions allow of quick work. The main thing is to load the machine quickly and get it away. The first trucks adopted are generally put to full load work, and when used for house delivery of one-piece or a carload variety need a deal of handling before they can make good. In this class of work the conditions are so varied that body design suggestions would be mere guess work. For the full load work, however, there are several interesting schemes in use.

It is quite common for lumber work to load separately. That is, while the motor vehicle is away a hand truck is loaded, the load resting on rollers and the hand truck being the same height as the motor truck body. When the motor gets back empty it is backed up to the hand truck—or this may even be a platform the same height—and the load is rolled into the motor vehicle platform in a mit. Rollers in the floor of the motor

vehicle allow of this, a rear one being generally corrugated and the whole being fitted with a locking device so that the load cannot roll off when running uphill.

Fig. 6 shows how the load is discharged, the rollers being unlocked and a crank being fitted to the corrugated roller at the rear. On turning the crank the whole load is forced to the rear and tips to the ground when it over-balances. The machine then runs ahead, dropping the whole load to the ground. A number of firms are using bodies of this type with good success. There are several items to be watched in the design of the body, however.

#### Should Study Loading

In the first place it must be understood that the elastic limit of the rubber tires need be exceeded but once to break down the structure of the material, leading to quick disintegration on later use. In rolling the load to the rear, for instance, there is a point where the entire weight is borne on the tail end of the chassis. Therefore there must be no extra overhang to the body and this form of device could hardly be fitted to that type of vehicle which carried most of the load on the rear axle in normal position.

For the unloading operation it might be possible to build some form of jack for the rear end which could be let down when the load was wheeled to the rear, taking the strain off the rear axle of the car on separate small untired wheels or rollers resting on the ground. These would let down the extreme rear end of the chassis and block it up. After the load was rolled off in this case, the truck could be driven forward in the usual way to drop the load, the wheels of the truck having sufficient traction from the chassis to accomplish this. The load off, the

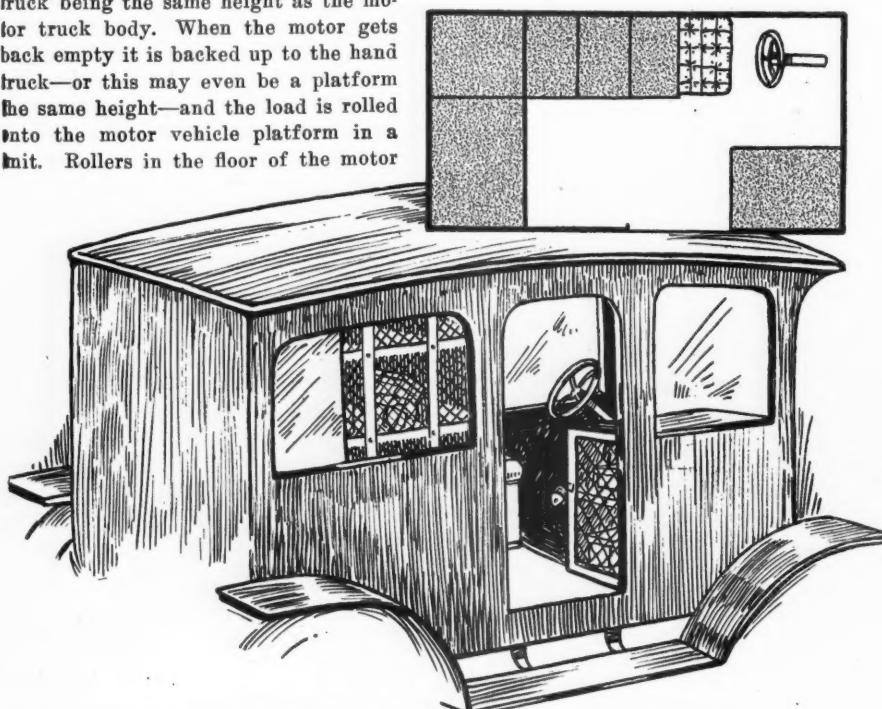


Fig. 13—Package body with side door for quick delivery

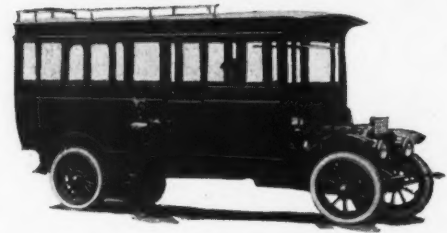


Fig. 15—A Chicago motor bus

jack truck could fold up under the rear end and be out of the way.

Lumber is being hauled by other firms on trailers, the power plant vehicle backing up to the trailer, coupling on and running away with it. A number of these trailers can be kept on hand undergoing the loading process to serve the one power vehicle. Trailers also are used to haul extra long pieces such as telephone poles and the like. For these steel tires have been used but with poor success where anything like speed is attempted.

Fig. 7 shows a motor truck with an extra heavy trailer hauling building timbers. In this form the body is slanted so that the load can slide to the rear easily and so when the trailer is fitted the sticks can overlap without hitting the rear end. The trailer is fitted with wide steel tires and a surface brake rubbing on the tire itself as on European steel-tired road tractors. It is needless to say that the speed with these steel-tired trailer loads must be kept low—probably not over 5 miles per hour.

#### Look Out for Bouncing Loads

Provision must be made in all bodies dumping lumber over the tailboard to prevent damage to the rear end from bouncing of the load after striking the ground, or catching of projecting pieces on any part of the car as the load drops or the end will be broken off.

Fig. 8 shows a truck used for telephone post setting. A motor truck has been used with a trailer for hauling the poles to the seat of work and once arrived the crane arrangement at the rear tends to the setting, doing the work of six men. It will be noticed that the rear end of the truck frame is jacked up before any lifting is done, to take the weight off the tires. The apparatus as shown is somewhat crude, but might be developed into a much lighter and more serviceable vehicle. The vertical post is the end of the drill for boring the postholes and driven by the long chain from the winch.

#### Used in Steel Delivery

Talking of really special bodies for long work, the 20-ton steam vehicle built for the George W. Jackson company is unique as shown in Fig. 9. This is hardly a body design but a whole vehicle, but is given as showing the requirements of steel delivery and as a suggestion of a way in which lumber might be handled without the present inconvenient dumping arrangements.

On the Jackson machine the weight is

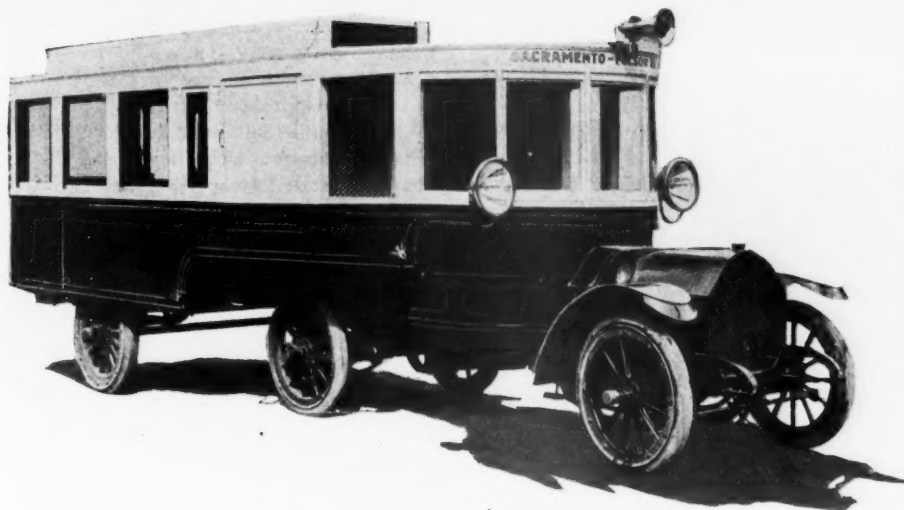


Fig. 16—Six-wheeled bus for interurban work

carried under the wheel axles, between the wheels of course and held up by chains from winches on the top frame above as shown. This chain is wound up or unwound by a lever and ratchet scheme, the long levers being plainly visible. Arrived at the point of delivery the load is merely let down, the truck drives on over it as it lays on the ground, and there is no dropping with danger of damage to beam, delivery, machine, and man operating.

#### Lumber Truck Well Designed

Fig. 10 shows a lumber truck designed on these lines. The rear axle drive in this case probably would have to be dispensed with and a scheme much like the couple-gear wheel or some other front drive adopted. The rear axle is dispensed with and some means taken, the one in the sketch being merely for purposes of illustration, to support these wheels separately, the trussing across being accomplished in the heavy timber or better steel frame above as shown. This leaves the body open at the back like a shed door, and in this form the driver can back it over a pile of lumber on the ground or a low cart as shown. In this position tackle of some quick-acting sort is arranged, fastening the pile of lumber securely and lifting it in the frame where it is wedged against side play and swing-

ing by means of side eccentrics or the like.

A device of this kind with the mechanical details worked out would allow of



Fig. 17—Motor bus for hotel work, with baggage rail on top

quick loading and unloading, the picking up of piles from the ground without re-

handling, no loss from breakage on dumping, and safety all around.

From the hauling of lumber to package delivery work is more than two jumps as in this branch of delivery conditions are almost opposite. Hauls are short and stops many; loading is of minor importance and unloading the chief factor making for success or failure.

#### Mistakes of Former Years

Early delivery wagons were copied when the first motor delivery vehicles were made for this work, horse practice obtaining largely. As a result there was some confusion and much delay that was avoidable. Not the least of the mistakes for package work was the rear door idea. In horse work there was no need for hurry to get the mileage from the horse but with the motor vehicle every minute saved meant money.

As has been pointed out elsewhere the saving of 1 minute per delivery, on 100 deliveries per day for thirty cars in use,



Fig. 18—Box body, with stake and wire sides

which is a figure equalled by a number of firms, would mean the saving to the firm of 50 hours per day or the cost of upkeep, extra men, etc., of eight vehicles of the same kind working 8 hours a day.

The saving of only 10 seconds per stop would mean the extra use of one vehicle a day or a cost about \$1,800 per year. All of this saving is worth going after and every device which can be fitted to a package or house-to-house delivery body which will save seconds is worthy of notice.

The accompanying sketches show ideas in use and ideas suggested as worth perfecting and while they are not intended as finished or developed arrangements which will fit every case, yet they are applicable to many and may start thought toward further ideas applicable to local conditions.



Stores using bodies with doors at the rear soon found out that too much time was wasted at stops. The driver had to dismount, run to the rear, take off his mittens, find the key, unlock the door, search for the package and find it, lock the door, and then make his delivery. All of this, especially in cold weather, consumed time, and stops were from 3 minutes up. By screwing up the rear door, taking the lazy-back off of the helper's side of the seat, and doing all delivery work over the seat this time was cut down by an even minute.

#### Package-Sorting Bugbear

There was still the bugbear of package sorting. The bodies were too long to reach from the seat to every package and the driver had to be climbing back continually to get at packages, his time being largely taken up in getting packages ready in their order for the boy or boys helping. In nearly all the vehicles the packages were put on the floor in order, the rest of the high space in the body being wasted while the packages on the floor with the large loads became a jumble hard to sort.

With small, short bodies this trouble was overcome by fitting shelves as in the drawing, a part of the packages being put on the upper shelf and in reach of the driver's hand. There was this disadvantage that if the upper shelf was put far enough forward to put the bundles in good reach the edge was in the way of getting at things below. A space was

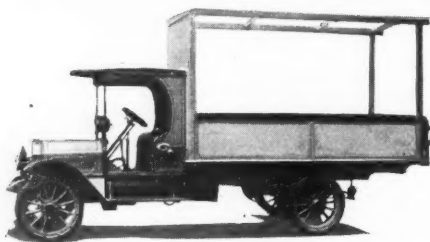


Fig. 19—Furniture body, with upholstered edges

therefore left between the driver and upper shelf as in the upper sketch of Fig. 10 to enable him to reach below.

To get around this difficulty a folding shelf as in the lower drawing might be fitted, this folding back on hinges at the corners arranged as at H, made of little end strips so that the boards can fold either way. In this way the shelf above as it is unloaded on the first of the route can be folded back and when completely empty fits back against the rear wall out of the way while the driver gets at the lower bundles. A stick with a hook on the end for reaching bundles from the seat was described in a recent issue.

#### Good Suggestion Made

As another form of shelf a slatted belt arrangement as shown in Fig. 11 was suggested to the author some time since and might be of advantage in especially long bodies. This is merely as stated, a shelf in the form of a slatted belt that can be rotated forward to bring rear packages to the front. There would need to be some locking device in connection to keep

the belt from rolling under road inclinations.

An item worth noting in this drawing is the arrangement of the driver's seat, no provision being made for seating the helper alongside. The space next the driver's seat is left open so that to reach to the rear he can swing clear around. The seat even might be made to pivot. The bundles as obtained in their order are deposited in the recess at the front ready for the boy who can reach them handily from the running board without having to climb into the vehicle to get his bundles. The basket-like affair outside would be a help in good weather. When the basket is empty with no deliveries to be made the boy can sit on the floor of the car with his feet in the package space.

This matter of helpers is important and on many routes where two or even three helpers are carried they spend almost no time on the truck, the driver spending his time sorting and getting deliveries ready for the boys, checking up C. O. D.'s, etc., and sending the boys away again as soon as they get back with another list of packages.

For this work there must be provision made for the helpers, that they can get on and off easily and without danger, have free access to the packages ready, and can be easily heard and spoken to by the driver without danger of misunderstandings through noise.

An arrangement for a gasoline car which fills these requirements in a large measure is shown in Fig. 12. This has a large door so the boys can get in and out easily, a generous running board and ample protection from danger in jumping on and off while the vehicle is moving.

#### Saves Time for Driver

Inside the driver has advantages for hurrying his sorting work so he can keep a number of boys busy with few delays and have time to make some deliveries himself. Where more than one helper is furnished a driver, unless he be a hustler and has facilities for working fast, he is likely to spend most of his time in the vehicle sorting and instructing boys. The shelf arrangement shown is meant to facilitate the sorting, etc.

The drawing explains itself and it is easy to see the gain through the driver being able to get quickly to the rear without climbing over anything. The shelves at the side have compartments according to route while the end space can take the too big parcels and lengths. This arrangement has the disadvantage that the weight of the load is on one side of the vehicle and would require an extra leaf in the spring on that side. For light loads, however, the scheme is good.

A further saving can be made and helpers handled easier by fitting a separate side door and arranging the body as in Fig. 13. This arrangement is an aid to getting in and out, there is a better balanced shelf room and across from the

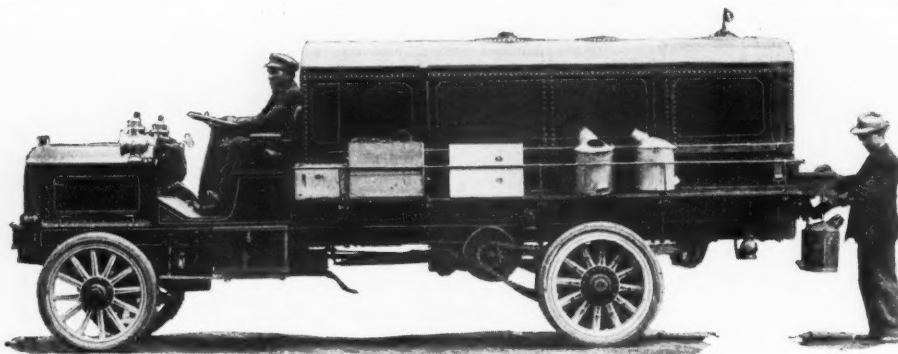


Fig. 21—Tank oil body with space for cans at side

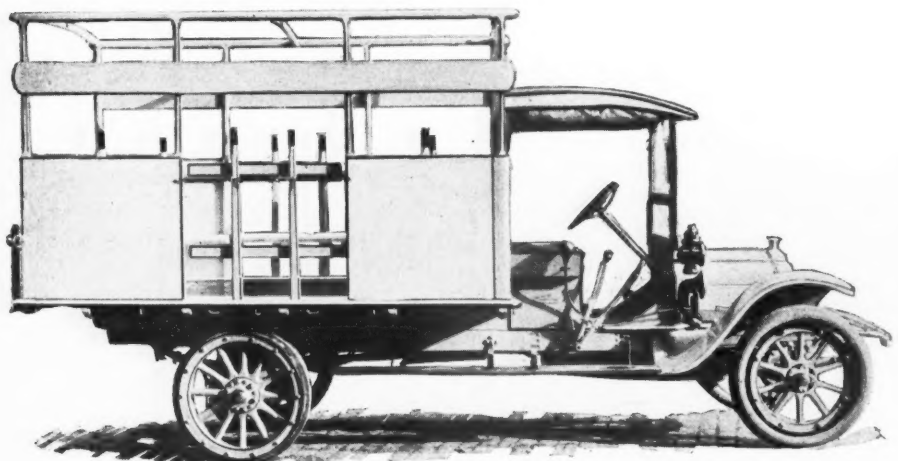


Fig. 20—Special body with side gates and bumper rail



driver can be a separate compartment for valuable packages or glass deliveries which need extra care in handling. On top of this section which fits under the right hand window, is a space for the parcels ready for the boys.

#### A Left-Hand Steer Advantage

In all package cars the steering gear should be on the left side so the driver can get out quickly when drawing up at the curb on the right-hand side of the road without having to run around the vehicle after stopping. The packages in the car can be arranged according to route the bins being labeled accordingly.

The Case & Martin Pie Co. uses a body somewhat suggestive of this arrangement for the delivery of its pastry product in Chicago. This vehicle is shown in an accompanying illustration, Fig. 14. There are no front doors, and the seat for the driver, who has no helpers ordinarily, is on one side. Through the center of the vehicle runs a passageway, while on either side are racks closed by doors containing the pies. Several hundred pies are carried without danger of damage and yet are very accessible. The drivers sell to the trade off of the wagon. The only entrance and exit is by the door at the rear, the step being seen at the back. A body similar to this but preferably with a side door could be used for package work if the body were made wider by flare boards.

#### Bus Body Design

In designing bodies for motor bus work a new set of conditions arises. Here comfort for the load must be sought along with other lines. Speed is an object and quick starting and stopping ability valuable. This suggests a high-powered motor and yet the weight must be kept down if economy would be had. In the first place the chassis design is of importance as related to body design and a firm ordering motor chassis for a city line recently was forced to reject as possibilities a number of makes of vehicles of known worth on account of the frame being too high. For bus work a common truck chassis hardly will do, though several approach what is wanted. These vehicles must be built low, have long and easy springs, plenty of power, exceptionally easy control, including extra large brakes and possibly an extra speed in the gearset for quick work, and be capable of speed without injury. Absence of noise is an important point.

As to the body design, this will be determined by very many reasons. The cost item is first and the body design will depend on how elaborate a design is wanted to appeal to the public which is to ride. Every inch of inside space must be utilized to advantage for seating and standing accommodation. The driver must have ample protection and it is an advantage in some cases if the driver can act as conductor as well. For big buses this is unnecessary.

Fig. 15 shows one of the fleet of

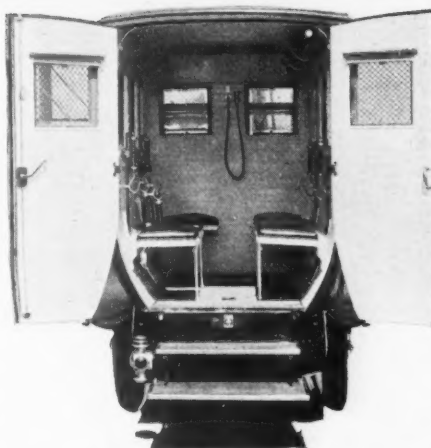


Fig. 22—Combination patrol and ambulance

White buses which have operated in Chicago from the department store centers to the depots. These vehicles have side doors opposite the driver's seat so all passengers entering pass by the driver who rings up the fares as he collects. The door is opened and shut by the driver who has the catch handle within the reach of his hand.

A rigid body such as is fitted to a chassis for bus or van work throws considerable stress on the chassis through its very rigidity and at the same time is apt

to be loosened up by the twistings unless heavily and carefully made. Buses ordinarily operate on hard tires which only adds to the body difficulty. It is possible that steel will be used eventually for bus body work.

In America there is little call for the European type of bus with accommodation for more than half of the passengers on the roof, the inclosed type being standard. The double-deck type it is said is losing ground in Europe. Just what type of body will be the final one for use in American cities is still a problem.

#### Suburban Motor Buses

For suburban and intercity work bus bodies often combine freight and passenger work. An ingenious body actually in use in the west is shown in Fig. 16, where an enterprising firm took a second-hand touring body and fitted a rubber-tired trailer behind, of wider tread and carrying most of the load. The vehicle is said to be doing its work well and the body is especially interesting. It is not ungainly in appearance and seems well fitted to intercity work with accommodation for passengers at the rear and express freight at the front. A sensible cab is fitted for the driver.

Buses for hotel work are generally small and frequently fitted with pneumatics for

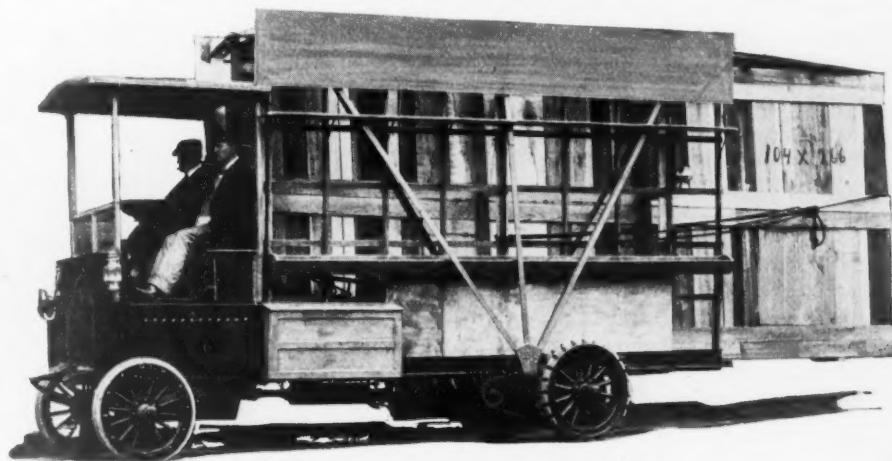


Fig. 23—Body used for hauling glass



Fig. 24—Copper-lined ice cream delivery body



Fig. 25—German military body of standard type

greater speed. The appearance of the car is part of its value in drawing trade and the appointments must be carefully done. Fig. 17 shows an Autocar bus running for a Canadian hotel. The baggage rail on the roof will be noted.

#### Van Body Design

In building a van body the question of body weight is important and the value of proper arrangement of weights and loading. Clean-cut appearance always is an object to be sought for and the several van bodies shown in Figs. 18, 19 and 20 show three popular types built by the Jacob Press Sons Co. of Chicago.

The main feature to be noted in all three is the Press guard rail running along the lower edge of the body to protect it from rubbing against other vehicles or objects and scratching the paint. The writer looked over a body that had been in use a year and saw no scratch on the paint, while six other trucks without bumpers seen within the next half hour all had at least one long scratch on the side.

Fig. 18 is a body having the advantage of lightness while it is at the same time burglar-proof, to the extent that bundles cannot be easily taken off or lost. When the weather demands, a tarpaulin is drawn over the framework and the rain excluded. The saving in body weight is well worth the extra trouble of the tarpaulin labor for this type of work. The wire netting makes a strong and light bracing and can be quickly removed with the stakes if desired. About 6 inches clearance is allowed over the tires.

#### Furniture Body Types

Fig. 19 shows a very neat and trim furniture body designed and built by the Press company which has the advantage of no side stakes to interfere with side unloading of long pieces. The rail or edge of the body is upholstered with carpet to prevent the scratching of furniture and all sharp corners are avoided. The amount of overhang allows an extra foot forward so some of the weight is thrown on the front wheels, but the most of the load balances over the rear axle. A neater looking job would be hard to imagine, the very simplicity of its lines being part of its practicability.

Fig. 20 also has the bumper or guard rail around the lower rim of the body, this being wide enough so the driver can

climb around outside of the body on it. A feature of this body is the removable side section to permit side loading and the frame to hold up the tarpaulin in rainy weather similar to the one in Fig. 19. These three bodies are exceptionally well thought out and constructed and look decidedly practical.

Hauling building material includes so many branches that no one type of body can fit all classes of this work, which may include hauling anything from steel girders to metal lath and shingle nails. The main branches to be met, however, probably are in the line of contractors' materials such as sand, lime, brick, tile and the like. For any vehicle working around buildings in process of construction a short turning radius is desirable and for dumping sand bodies front wheel drive almost a requirement. Low bodies are the handiest, especially where there is hand unloading. In brick loads, for instance, where a costly grade of brick must be carefully handled by hand, a flat load wide and long is quicker unloaded and loaded than a high, short load as there

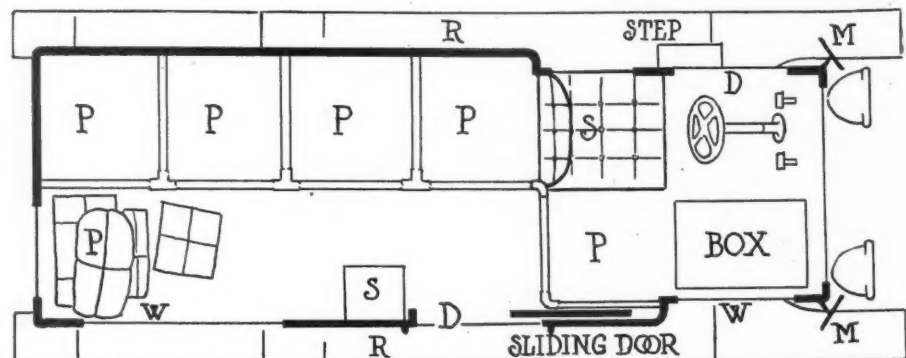
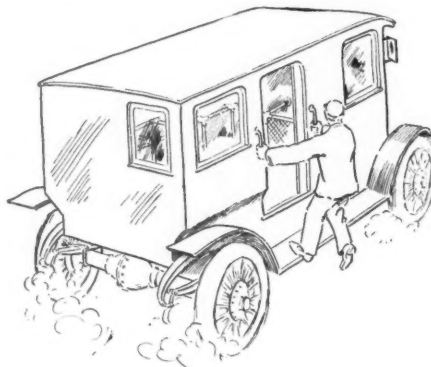


Fig. 27—Parcels post body suggestions

is less lifting. This point is important. A brick body on a 5-ton truck looks very small at best.

Of the opposite type is the barrel or box truck, the bodies on these vehicles of 2-ton capacity being often larger than the ordinary bulk body on a 5-ton chassis. If a roof is fitted to these bodies there should be a trap door or opening of some kind provided for loading the barrels or boxes by chute through the roof.

The rest of the illustrations show miscellaneous types of motor truck bodies, each with good ideas. Fig. 21 is a tank body for oil. The complete arrangement is very handy, the center of gravity not too high and the space along the sides for the empty cans with the guard rail to hold them in is well thought out.

Fig. 22 shows an ingenious combination ambulance and patrol wagon fitted to a Speedwell chassis. This body is beautifully made, fitted with the main requirements of a hurry-up ambulance and with folding side seats so that it can be used as a police wagon when wanted. It might be a question if the average tobacco-chewing policeman would leave the vehicle in a sanitary condition for ambulance use after a half a day's run in police department work.

#### For Carrying Window Glass

Fig. 23 is an illustration of a motor body and truck fitted up for the quick carrying of window glass. The framework in this case is of steel and is very light and strong, giving every protection against breakage.

For ice cream delivery the vehicle body shown in Fig. 24 is exceptionally well thought out. The space at the center allows the delivery man to get on and off quickly and to reach any part of his load from this point. The canopy overhead is ample protection against a hot sun and can be drawn back very handily as required. The light weight of the body as compared with those fitted with a top is worth thinking about. The chassis is a standard Packard 3-ton outfit. The inside length of the body is 12 feet and the width 6 feet, 2 inches. The sides are 3 feet high.

The inside is completely lined with copper without a bolt or screw hole in it as a protection against salt water getting on the working parts of the chassis. There is



a drainage system which carries all waste to the rear of the rear axle away from all mechanism. Over the copper lining is a steel mesh grating to protect against blows. This extends 5 inches up the sides. The front compartment is divided into three sections—one for salt, one for cracked ice and the third for cans and buckets. Cans of cream are carried in the rear compartment packed in ice. This body is especially complete for the work in hand.

#### Trucks for Military Use

A type of military truck which is almost standard in Germany is shown in Fig. 25. Every motor truck in this country is so heavily subsidized by the government if it conforms to government specifications that nearly all manufacturers follow the government type. This machine is shown in use with a trailer. Steel wheels are fitted to the truck and wood ones to the trailer.

Fig. 26 is a French military field workshop fitted to a motor truck, the body sides folding down for half their height

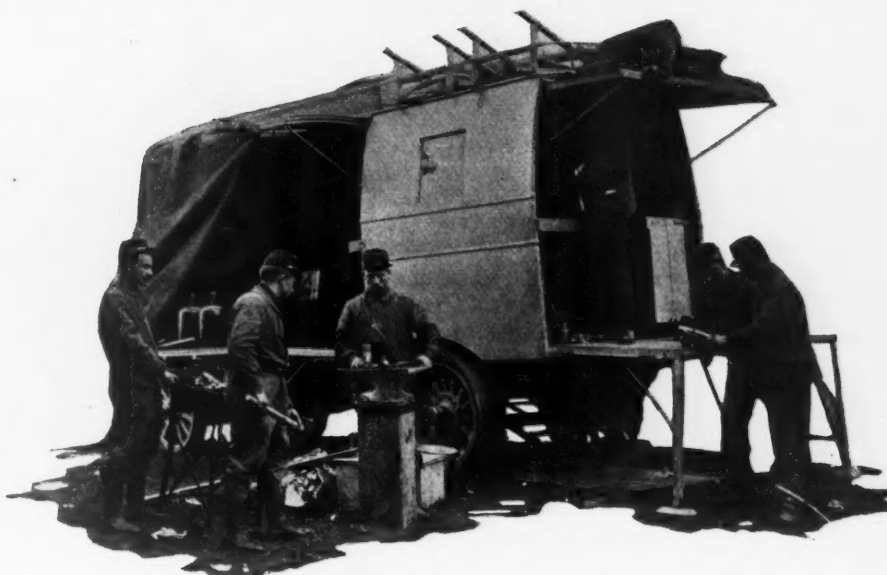


Fig. 26—French military truck with workshop body

The package cars shown would fit this work well, but in Fig. 27 is shown a de-

terior arrangements which are handy to an extreme.

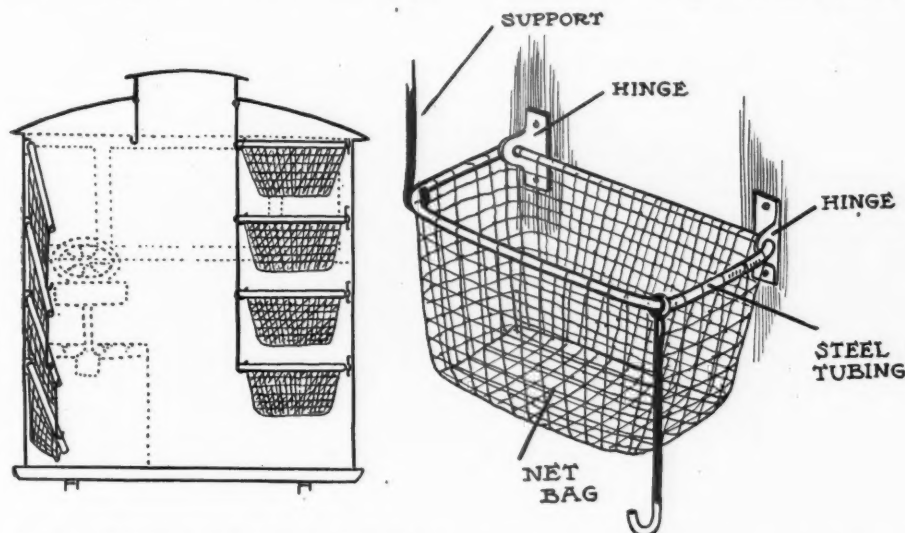


Fig. 28—Chicago Superintendent of Mail Delivery Steward's idea for parcels post folding mail baskets for interior of truck body

and up for the top part, to form a side platform and roof as shown. The rear end works the same way. Inside the equipment is complete.

A discussion of bodies would not be complete without a study of what would be advisable for parcels post delivery work. As yet this field is new and the trade small, but it is bound to grow into a network of delivery which will cover the whole country. The line of delivery will be much like that of package delivery companies or department stores except that the packages will be smaller.

#### Parcels Post Delivery

Judging by the first few days of parcels post delivery work, the Chicago post-office authorities are of the opinion that the packages will average about 6 pounds apiece. If this be so—and the maximum is 12 pounds—the design of a parcels post body is not so difficult as that of ordinary package work with greater variation.

sign of body with side door for quick work, flaring body for capacity and in-

terior arrangements which are handy to an extreme. The first idea was for pigeon holes or bins like on package cars, but at the suggestion of Colonel Steward, superintendent of delivery for Chicago, these are shown in the form of network bags on folding steel tube frames, as in Fig. 28. These are used as separate compartments and as fast as they are emptied according to the route are folded down against the wall. There are hooks provided from the ceiling to hold the steel frames in position, this, in the form shown, necessitating the folding of the lower compartments first. Other schemes might easily be arranged.

#### For Hauling Pipe and Steel

Fig. 29 shows a type of body used by the Crane Co. of Chicago for hauling pipe and steel. The seat is in the center of the car, and spaces left on either side. This allows the long pieces to project out in front of the vehicle as well as to the rear. The right hand sketch shows another device on a standard truck body to permit the same advantage, a door D being opened when lengths of pipe, etc., are carried.

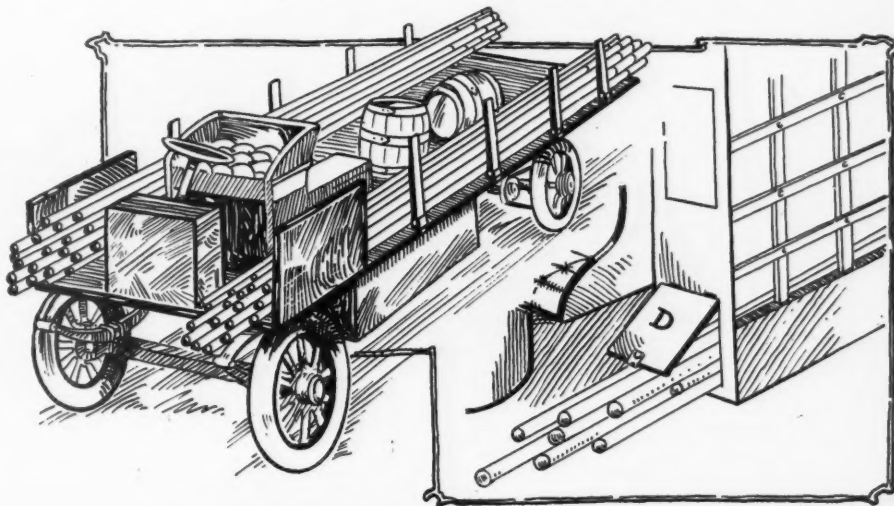


Fig. 29—Body designed for carrying pipe and iron lengths



# How to Use the Commercial Car Tables

COMMERCIAL cars of uncommon construction are to be noted in the specification tables on the following pages as well as those of conventional design. The Motorette, Four-Wheel Drive and Couple-Gear are examples of these oddly constructed vehicles, the first being a three-wheeled chassis used mainly for small package delivery.

The Four-Wheeled Drive as the name implies has the motive power transmitted directly to the four wheels instead of to the rear wheels only, as is the case in the majority of cases. The Couple-Gear, another unusual type in the field of motor trucks, is known as a car with a gas-electric plant. In this a gas engine is used to operate a dynamo. The current generated by the dynamo is transmitted to motors, one at each wheel. The ends of the armature shafts are geared and connect with a planetary gearset in the wheel.

A veteran type in motors is to be seen in the two-cylinder opposed motor characteristic of a number of commercial vehicles on the market for 1913. The Schmidt, Oliver, Lincoln, Monitor and Best are a few examples of cars with this type of engine. At the extreme right of Fig. 1 is an illustration of the two-cylinder opposed motor. As it appears in the illustration the flywheel is facing downward and the two cylinders placed on either side of the crankcase.

Each name in the table of specifications represents a distinct chassis; thus the Peerless TC model is made in eight chassis styles, each chassis having a different tonnage, except in the case of the 4-ton truck. The wheelbase differs in these two models as does the chassis weight. A difference in tire size distinguishes one chassis from another.

In a number of instances certain information is not given in the tables. This may be due to the inability on the part of the manufacturer to give this information in time for publication, or perhaps because the engineers have not definitely decided upon the data. The weights, for example, may not be known, for the market vehicle may differ in weight from the experimental car.

It may be noticed that some manufacturers are not listed and it should not be inferred from this that cars of this make are not in the course of construction. A change in factory principles, or an entire change in truck design, will sometimes cause a maker to withdraw from the field temporarily. The Lozier truck, for example, will not be found in the tables, and although no definite data has been given out regarding Lozier plans, it should not be taken for granted that the Lozier company has discontinued the manufacture of trucks.

Better results will be obtained if the specification tables and truck buyers' guide printed on the following pages are used in a systematic way. The tables were compiled to facilitate truck purchasing and also as a means of comparing one make of commercial vehicle with another. Then, too, the tables if properly used, show the tendencies for the coming year and may be used as interesting data to the persons who wish to familiarize themselves with motor truck characteristics.

Let us suppose that a commercial car is to be bought by a lumber company. The requirements set down by this company are that the truck should be able to carry at least 2 tons, have certain body dimensions, be of ample power, and cost not more than \$3,000. The first step to become acquainted with cars living up to these requirements, is to consult the 2 to 3-ton class in the buyers' guide. All the cars having the required carrying capacity and body dimensions and costing not more than \$3,000 may be segregated. In many instances the body styles are optional, but maximum dimensions are given. The dimensions of the car desired should not exceed those shown in the tables if the regular price is to be paid. After the cars have been selected from the buyers' guide, the next step is to compare the mechanical features of these cars in order to determine which will make the most suitable purchase. These features will be found in the table of specifications.

The horsepower, tire size and wheelbase, as well as the other necessary points

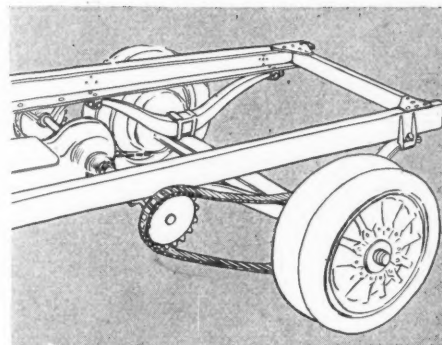


FIG. 2—SHOWING DOUBLE-CHAIN DRIVE

should be considered more than body style, for in the majority of cases the maker can fit any style of body desired.

In judging the car from a mechanical viewpoint one thing must be remembered, and that is that because the car specifications do not exactly fit the ideal standards is no reason why the vehicle is not worthy of consideration. A T-head motor on one car does not make it better than a car with an L-head motor. Of course design is to be considered, but the L-head type may give just as great an efficiency as the other. Because it is thought by some that a disk clutch is better than a cone clutch does not necessarily follow that it is true, for the cone clutch on one car may be just the thing for it, for it coincides with the car design and has been found satisfactory.

When the matter of price enters, material and workmanship must be thoroughly investigated for in material lies the life of the motor truck. The body dimensions must live up to the requirements set down by the enterprise for which it is intended. For example, the lumber trade demands exceedingly long bodies, while the grocery business does not call for lengthy bodies. But here again it must be said that the majority of manufacturers will give any style body desired, and in most cases at little advance in price from the standard type.

**Name and Model**—Each line in the specification tables represents a distinct chassis. The fact that the wheelbase of one car is longer than another of the same manufacturer, makes it a different chassis. A difference in tire size is made to distinguish two chassis.

**Load Capacity**—The capacity given in the tables is the maximum load that the vehicle will hold with safety.

**Cylinder Shape**—L-head and T-head refer to cylinders whose shape resembles those shown in Fig. 1. The L-head resembles the letter L inverted and the T-head the letter T. The straight cylinder and the 2-cycle cylinder may be classed as one, with the exception that the

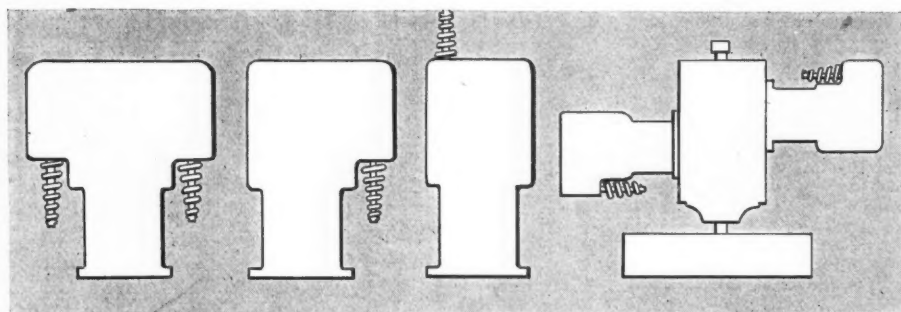


FIG. 1—THREE CYLINDER SHAPES AND TWO-CYLINDER OPPOSED MOTOR

# and Short Explanation of Terms Used

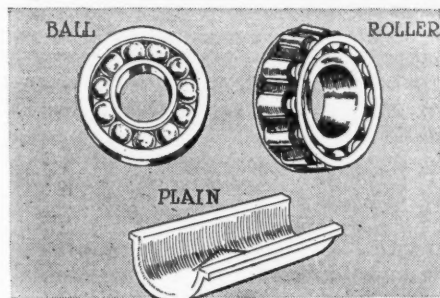


FIG. 3—BALL, ROLLER AND PLAIN BEARINGS

straight or I-head conveys the idea that the valves are in the head. In the tables this is designated as head. The two-cycle engine always has cylinders of the I-head type, the valves in this case being ports cut out of the cylinder wall instead of poppet valves as in the other cases.

**Chassis Weight**—The weight of the vehicle without body, load or gasoline and oil is that given in the table of specifications. The omission of this data in some instances is due to the fact that the manufacturer neglected to give this information.

**Turning Radius**—By this term is meant the shortest distance required to turn the vehicle around without reversing. For instance, standing at the curb and facing north the 5-ton Kisselkar truck would require the freedom of a circular area whose radius is 26 feet, in order to head the car southward.

**Tires**—When not otherwise noted, the tires are single tires. The asterisk after the word solid, thus, SOLID\*, indicates that the rear tires are of the dual type, or in other words, have two tires on the one wheel. Optional in the case of tires indicates that the purchaser may select pneumatic or solid as he wishes.

**Bore and Stroke**—The bore and stroke appear in the tables together, the first figure being the bore and the second the stroke. For example, the line may be read 5.8x6.0 which means that the bore is 5¾ inches and the stroke 6 inches. The bore and stroke are given to the nearest 1/10-inch.

**Horsepower**—The horsepower is that obtained by the use of the S. A. E. formula  $D^2N$

—, in which  $D^2$  is the square of the bore 2.5

in inches and  $N$  is the number of cylinders. The denominator 2.5 is called the constant and has been found by the Society of Automobile Engineers (S. A. E.) to be applicable to the four-cycle engine.

**Cylinder Casting**—Pairs refers to cylinders that are cast two in a single casting and in the case of a four-cylinder motor, the latter would consist of two

castings of two cylinders each. In the block casting all the cylinders are made in a single casting. This is often referred to as an integral casting. The word separate is used to show that the cylinders have been cast separately. A four-cylinder motor with such cylinders would have four cylinders that are removable one at a time, whereas in the block casting all must be removed. The two-cylinder opposed type, Fig. 3, always has cylinders cast separately.

**Camshaft Drive**—When the word gear is mentioned the common spur gear is implied. Spiral, worm and helical refer to these different types of gear teeth.

**Cooling**—When a pump is used to maintain circulation the water is forced through its path by means of a centrifugal or gear pump. The thermo-syphon system takes into consideration the fact that hot water will rise and does not require the use of a pump, as the circulation is a natural one. In such cases the radiator is usually placed high above the motor.

**Radiator Suspension**—To protect the radiator from unnecessary shock it is suspended on springs or trunnions or both.

**Ignition System**—The single system consists of one source of current and one set of plugs. The source of current is usually a storage battery or magneto. The dual system makes use of two sources of current and one set of plugs. In this case both magneto and battery are used. In the double system, two sets of spark plugs are required and two sources of current. However, in this case one set of plugs operate on the battery and the other set on the magneto.

**Ignition Control**—The hand control is familiar to all. The automatic control is one in which the spark automatically advances with an opening of the throttle and retards with the closing of the throttle or a correspondingly change in motor speed. In the fixed control, the spark is made to occur at a given point regardless of motor speed. When a motor has governed ignition the governor on the magneto shaft makes the spark advance automatic. Only in the case of hand control is the driver permitted to advance or retard the spark; in the other instances this is done by motor mechanism.

**Gearset Type**—In the selective gearset, any speed may be obtained without first going through any other speed. In this type a shift may be made from first directly to high. In the progressive type, on the other hand, in order to obtain third, it is necessary to pass through second. The planetary gearset consists of one big gear with internal teeth having within it and meshing with these teeth one or more small gears. In the planetary

type the gears are always in mesh. The friction gearset consists of a driven disk pressing against a driving disk which is attached to a shaft which directly or indirectly revolves the rear wheels. In the individual clutch type of gearset, the gears do not slide but are always in mesh. The countershaft is driven by the master gears in the usual manner, and the direct drive is obtained by a dog clutch. The reduction drives are had by means of individual dog clutches secured to the driven shaft and which engage with corresponding clutch members on the sides of the driven gears, loosely mounted on the driven shaft.

**Clutch Type**—Expanding band and contracting band are the only two types requiring explanation. Both these types resemble the common emergency brake, the former consisting of two semi-circular bands that expand against the flywheel, while the latter are of the same appearance but contract against the flywheel.

**Bearings**—The plain bearing is in the majority of cases used in the motor as a means of supporting the crankshaft and also for the connecting rod ends. The specification tables do not mention motor bearings but it may be taken that the greater percentage of these are of the plain type shown in Fig 3. They are made of babbitt metal, Parsons white brass, phosphor bronze, or a combination of one or more of these soft metals. The roller bearings shown in Fig. 3 are used mainly in the gearset. As will be noticed in the illustration, a number of small rollers revolve upon their own axes. There are numerous types of roller bearing, but the fundamental principles in each are the same. The other type of bearing, the ball, is shown in the illustration in its common form. The ball thrust bearing has a

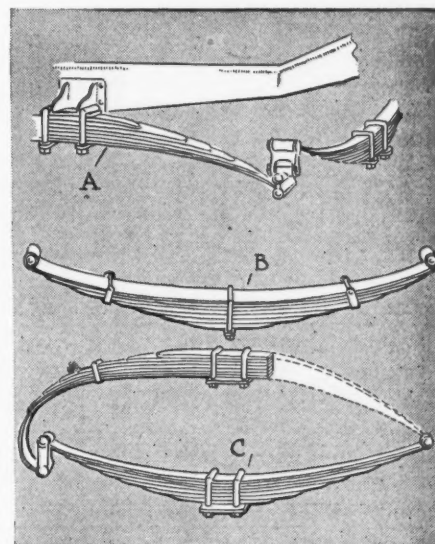


FIG. 4.—FOUR TYPES OF SPRINGS: A, PLATFORM; B, SEMI-ELLIPTIC; C, THREE-QUARTER ELLIPTIC AND ELLIPTIC



case over the balls used to take up end thrust. Some ball bearings are manufactured as ball-and-thrust. The circular pieces of metal upon which the balls roll are known as the races.

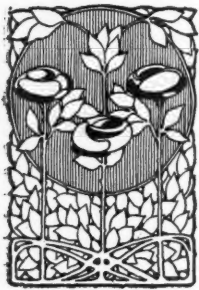
**Final Drive**—In the bevel drive the power is transmitted from the propeller shaft through bevel gears to the rear axle. Worm drive means that a worm gear is used instead of a bevel. The external gear drive consists of an axle shaft parallel to the dead rear axle. The ends of the axle halves are geared and these gears mesh with those mounted on the rear wheels. The internal gear drive is

somewhat similar but instead of the wheel having a gear with external teeth, the teeth are on the inner periphery of the gear.

The Four-Wheel Drive and Couple-Gear are commercial vehicles that differ greatly from the customary form. The Four-Wheel Drive instead of being driven by one shaft and through gears to the rear wheels as in most vehicles, all four wheels are driven. The front wheels perform two operations, that of steering and driving while the rear wheels drive, but are not used for steering. The Couple-Gear is known as a gas-electric car. In this case

a gas engine is used for the purpose of operating a dynamo, the current from the latter operating a motor on each of the four wheels. The motor shafts are directly geared to the geared wheel. The Couple-Gear uses all four wheels for steering purposes. The chain drive, Fig. 2, consists of a chain from a jackshaft turning the rear wheels.

In the illustration the drive is known as a double-chain drive because two chains, one at either end of the jackshaft drive the rear wheels. There is another type known as the single-chain drive in which one chain is directly connected to a gear



# 1913 Specifications of American

Complete Technical Details of Each of the Chassis Models of Commercial Vehicles  
Produced by American Makers for the 1913 Season, Including S.A.E. Horse-  
power Ratings of Each, Turning Radius and Chassis Weight

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S.A.E. H.P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
A & R, 3 ton	6,000	Opt ..	Opt ..	Opt ..	Opt ..	Opt ..	Opt ..	4	5.0x5.8	40.0	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
A & R, 4 ton	8,000	Opt ..	Opt ..	Opt ..	Opt ..	Opt ..	Opt ..	4	5.0x5.8	40.0	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
A & R, 5 ton	10,000	Opt ..	Opt ..	Opt ..	Opt ..	Opt ..	Opt ..	4	5.0x5.8	40.0	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
Adams, D	3,000	3,900	41	140	Solid*	36x3 1/2	36x3	4	3.9x5.0	24.0	L Head ..	Block....	Right....	Gear ....	Pump ...	Rubber ..
Adams, A	3,000	3,200	41	121	Solid*	36x3 1/2	36x4	4	3.9x5.0	24.0	L Head ..	Block....	Right....	Gear ....	Pump ...	Rubber ..
A. I. C., B	10,000	8,000		136	Solid*	36x6	40x5	4	4.3x6.8	28.9	L Head ..	Pairs....	Left .....	Hel'l ..	Pump ...	Springs....
Akron, A	1,500	2,300	27	118	Solid*	34x4	34x4	4	3.8x5.0	24.0	L Head ..	Block....	Right....	Hel'l ..	Pump ...	Brackets ..
Alco, 2 ton	4,000							4	4.5x5.5	32.4	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Trunnions..
Alco, 3 1/2 ton	7,000							4	5.0x6.0	40.0	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Trunnions..
Alco, 5 ton	10,000							4	5.0x6.0	40.0	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Trunnions..
Alco, 6 1/2 ton	13,000							4	5.0x6.0	40.0	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Trunnions..
Angaize, B	1,500	2,000		100	Solid*	36x2	38x2	2	5.3x4.0	22.1	Straight	Sep'rt ..	Head .....	Gear ....	Thermo ..	
Angaize, D	2,000	3,700	20		Solid ..	36x3 1/2	40x4	4	3.8x5.3	22.5	L Head ..	Block....	Right....	Gear ....	Pump ...	
Armleder, C	1,500	2,000	28	114	Pneu...	34x4	34x4	4	3.3x4.0	16.9	L Head ..	Block....	Right....	Gear ....	Pump ...	Springs....
Armleder, B	2,000	3,100	34	136	Opt ..	40x4	40x5	4	4.0x4.3	25.6	L Head ..	Block....	Left .....	Gear ....	Thermo ..	Springs....
Armleder, D								4	4.5x5.0	32.4	L Head ..	Block....	Right....	Gear ....	Pump ...	Springs....
Armleder, F		3,000	37	142	Solid ..	39x6	39x6	6	4.1x5.3	40.9	L Head ..	Pairs....	Right....	Gear ....	Pump ...	Springs....
Atterbury, A	1,500	3,200	13 1/2	116	Solid ..	34x3	34x3	4	3.8x4.5	22.5	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
Atterbury, B	2,000	3,600	15	128	Solid ..	36x3 1/2	36x4	4	4.0x5.5	25.6	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
Atterbury, C	4,000	4,300	17 1/2	143	Solid*	36x3 1/2	36x3 1/2	4	4.3x5.5	28.9	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
Atterbury, D	6,000	5,600	20	153	Solid*	36x4	36x4	4	4.9x5.5	38.0	T Head ..	Pairs....	Opp .....	Gear ....	Pump ...	Springs....
Atterbury, E	10,000	6,000	20	153	Solid*	36x5	42x5	4	4.9x5.5	38.0	T Head ..	Pairs....	Opp .....	Gear ....	Pump ...	Springs....
Autocar, 21 1/2	3,000	3,300	38	97	Opt ..	Opt ..	Opt ..	2	4.8x4.5	18.1	L Head ..	Sep'rt ..	Head .....	Gear ....	Pump ...	Springs....
Available, 15	1,500	1,900	34	100	Solid ..	34x2	34x2	2	5.3x4.0	22.1	L Head ..	Sep'rt ..	Left .....	Gear ....	Thermo ..	Springs....
Available, 24	2,000	2,250	34	102	Solid ..	34x2 1/2	34x3	4	3.8x4.5	22.5	L Head ..	Block....	Right....	Gear ....	Thermo ..	Springs....
Avery, B	6,000	6,250		128	Solid*	38x5	38x4	4	4.8x5.0	36.1	L Head ..	Sep'rt ..	Left .....	Gear ....	Pump ...	Springs....
Avery, A	6,000	5,700		140	Wood ..			4	4.8x5.0	36.1	L Head ..	Sep'rt ..	Left .....	Gear ....	Pump ...	Springs....
Avery, 5 ton	10,000	7,250		140	Solid*	38x6	38x5	4	4.8x6.8	36.1	L Head ..	Pairs....	R & H....	Gear ....	Pump ...	Springs....
Barker, 3 ton	6,000	5,650		150	Solid*	36x3 1/2	36x4	4	5.0x4.8	40.0	L Head ..	Pairs....	Right....	Gear ....	Pump ...	Springs....
Barker, 5 ton	10,000	6,350		150	Solid*	36x4	36x5	4	5.0x4.8	40.0	L Head ..	Pairs....	Right....	Gear ....	Pump ...	Springs....
Beck, 2 ton	4,000	2,400	22	130	Solid ..	36x4	36x5	4	4.0x4.5	25.6	T Head ..	Sep'rt ..	Opp .....	Gear ....	Pump ...	Springs....
Beck, 3 ton	6,000	2,800	25	130	Solid ..	36x4	36x6	4	5.0x6.0	40.0	T Head ..	Sep'rt ..	Opp .....	Gear ....	Pump ...	Springs....
Beck, 1 ton	2,000	2,000	25	128	Solid ..	34x3 1/2	38x4	4	4.0x4.5	25.6	T Head ..	Sep'rt ..	Opp .....	Gear ....	Pump ...	Springs....
Bergdoll, C-30		2,600		115	Solid ..	34x4	34x4	4	4.0x5.0	25.6		Block....			Pump ...	
Bessemer, K	1,000	2,075	28	102	Solid ..	34x2	34x2 1/2	4	3.5x4.5	19.6	L Head ..	Block....	Left .....	Gear ....	Thermo ..	Springs....
Bessemer, B	2,000	2,900	33	120	Solid ..	34x3	34x3 1/2	4	3.8x5.3	22.5	L Head ..	Block....	Left .....	Gear ....	Thermo ..	Springs....
Bessemer, C	3,000	3,000	33	136	Solid ..	34x3 1/2	34x4	4	3.8x5.3	22.5	L Head ..	Block....	Left .....	Gear ....	Thermo ..	Springs....
Best, A & B 1/2	1,000	2,100	30	79				2	4.5x4.5	16.2	L Head ..	Sep'rt ..	Top .....	Gear ....	Thermo ..	Springs....
Best, 1-ton	2,000							4	3.8x4.5	22.5	L Head ..	Block....	Right....	Gear ....	Thermo ..	Springs....
Blair, C	3,000	4,200		114	Solid ..	34x4	34x3	4	4.1x5.3	27.3	L Head ..	Block....	Left .....	Gear ....	Pump ...	Springs....
Blair, D	5,000	5,100		121	Solid ..	34x4	34x3 1/2	4	4.5x5.5	32.4	L Head ..	Pairs....	Left .....	Gear ....	Pump ...	Springs....
Blair, E	7,000	6,600		144	Solid ..	36x5	36x4	4	4.5x5.5	32.4	L Head ..	Pairs....	Right....	Gear ....	Pump ...	Springs....

†Three wheels. ††Two-cylinder opposed. \*Drives on four wheels. †††Gas-electric power plant.  
ABBREVIATIONS:—Tires: Solid\*, solid dual tires in rear. Cylinders: Sep'rt, separate. Valves: Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. Camshaft Drive: Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. Cooling: Thermo, thermo-siphon. Radiator Suspension: S & T, springs and trunnions. Ignition: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Press, splash and pressure; In Fuel, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3=4 3/10 etc., .2=2/10, .1=1/10, .3=3/10, .4=4/10, .5=5/10, .6=6/10, .7=7/10, .8=8/10, .9=9/10.



on the rear axle. However, this type is fast losing its popularity. Fig. 2 shows the location of the jackshaft. There are two sprockets, one at each end of the jackshaft, but only one of these sprockets is visible in the illustration. In all double-chain driven vehicle the rear axle is dead, that is, it does not turn. In such cases the wheel has attached to it a sprocket which is turned by the chain. The jackshaft is contained in a housing or case and may be of any type floating, semi-floating, or three-quarters floating. The figure also shows a dual rear tire.

**Lubrication**—In the splash system, the

ends of the connecting rods dip into the oil reservoir in the crankcase and splash the oil to the cylinders and bearings of the motor by their centrifugal action. The pressure system is one in which oil is delivered directly to the bearings from oil tank. The splash-pressure system combines both the splash and the pressure, some of the oil being delivered directly to the bearings and assisted by the splash.

**Springs**—Fig. 4 shows the three types of springs mentioned in the tables. B, being of the semi-elliptic class, C of the three-quarter elliptic, and, when the dotted line is taken into consideration, the

elliptic. The platform suspension is shown at A.

The method of spring suspension varies with each make of commercial vehicle. The shackle bolt which holds the platform spring to the semi-elliptic is made in any number of shapes and sizes. The suspension lettered A in Fig. 4 shows the platform spring secured to the rear of the frame and attached at its ends to a semi-elliptic spring. The clips shown around the spring leaves, whose number usually varies with each make of car, prevent the leaves from spreading and are not always in evidence.

# Gasoline Commercial Vehicle Chassis

*Specifications Include Every Mechanical Fact that Manufacturers, Dealers, and Buyers Require—Motor Design Specially Analyzed, Giving Oiling Systems—Also Transmission, Running Gear and Control Features of the New Product*



IGNITION			Carburetor	Motor Lubrication	TRANSMISSION					RUNNING GEAR					BEARINGS		
System	Magneto or Generator	Control			Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL			Gearset	Rear Axle
						Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gear-shift	Emergency Brake		
Dual		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3	4.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	B & R	Roll
Dual		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3	2.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	B & R	Roll
Dual		Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3	11.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	B & R	Roll
			Schebler	Splash	Diak	Sel	Amid	3	7.5-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
			Schebler	Splash	Diak	Sel	Amid	3	7.5-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
Sing	Simms	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3	10.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Schebler	Splash	Diak	Sel	Unit M	3	4.0-1	Bevel	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Diak	Sel	Amid	3	6.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Diak	Sel	Amid	3	7.6-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Diak	Sel	Amid	3	13.9-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Newcomb	Spl-Pres	Diak	Sel	Amid	3	13.9-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Spl'd'f	Hand	Schebler	Spl-Pres		Plan	Amid	2		Chain	Ell	Ell	Right		Pedal	Plain	Ball
Opt	Remy	Hand	Schebler	Spl-Pres	Diak	Sel	Amid	2	8.1-1	Chain	1/2 Ell	Plat	Right	Right	Left	Plain	Opt
Sing	Bosch	Hand	Schebler	Splash	Diak	Fric	Unit M			Chain	1/2 Ell	1/2 Ell	Left	Center	Left	Ball	Ball
Sing	Bosch	Hand	Schebler	Spl-Pres	Diak	Sel	Unit M	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Pedal	Ball	Ball
Sing	Bosch	Hand	Schebler	Spl-Pres	Diak	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Plain
Dual	Bosch	Hand	Schebler	Spl-Pres	Diak	Sel	Unit M	4		Bevel	1/2 Ell	Ell	Left	Center	Center	Ball	Ball
Dual	Bosch	Hand	Stromberg	Spl-Pres	Diak	Sel	Unit M	3		Bevel	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	B & R
Dual	Opt	Fixed	Stromberg	Spl-Pres	Diak	Sel	Unit M	3		Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Roll
Dual	Opt	Fixed	Stromberg	Spl-Pres	Diak	Sel	Unit M	3		Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Roll
Dual	Opt	Fixed	Stromberg	Spl-Pres	Diak	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Opt	Fixed	Stromberg	Spl-Pres	Diak	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Fixed	Stromberg	Splash	Diak	Pro	Amid	3	6.0-1	Bevel	1/2 Ell	Plat	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand	Schebler	Pressure	Diak	Plan	Unit J	2	5.7-1	Chain	Ell	Ell	Right	Right	Right	B & P	Ball
Dual	Briggs	Hand	Rayfield	Splash	Cone	Sel	Unit J	3	5.3-1	Chain	Ell	Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Schebler	Splash	Diak	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Eisemann	Auto	Schebler	Splash	Diak	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Plain	Roll
Dual	Eisemann	Auto	Schebler	Spl-Pres	Diak	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Roll
Dual	Remy	Hand	Optional	Splash	Diak	Sel	Unit J	3	9.0-1	Chain			Right	Right	Right	Ball	Ball
Dual	Remy	Hand	Optional	Splash	Diak	Sel	Unit J	3	9.0-1	Chain			Right	Right	Right	Ball	Ball
Dual	Bosch	Hand	Stromberg	Splash	Diak	Sel	Unit M	3	8.0-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Diak	Sel	Unit M	3	8.0-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Diak	Sel	Unit M	3	8.0-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Right	Roll	Roll
Dual	Bosch	Hand	Mayer	Splash	Diak	Sel	Unit M	3		Bevel	1/2 Ell	1/2 Ell				Ball	Ball
Sing	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	1/2 Ell	Plat	Left	Center	Center	Ball	Ball
Dual	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	1/2 Ell	Plat	Left	Center	Center	Ball	Roll
Dual	Briggs	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit J	3		Chain	1/2 Ell	Plat	Left	Center	Center	Ball	Roll
Dual	Gov	Marvel	Splash		Fric	Amid			6.1-1	Chain	1/2 Ell	Ell	Left	Left	Left	Roll	Roll
Dual	Hand	Marvel	Splash		Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Right			Plain	B & R
Dual	Bosch	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Right			Plain	B & R
Dual	Bosch	Fixed	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Right			Plain	B & R

**ABBREVIATIONS:**—Clutch: Exp B, expanding band; Con B, contracting band. Gearset: Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. Gearset Location: Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. Drive: Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. Springs: 1/2 Ell, semi-elliptic; Ell, elliptic; 3/4 Ell, 3/4 elliptic; Plat, platform. Bearings: Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B & R & P, ball roller and plain.

# Specifications American Commercial Cars, Including Horsepower,

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
Brockway, A.	1,000	1,575	30	100	Solid	36x2	38x2½	3	4.0x5.0		2 Cycle	Sep't			Air	
Brockway, B.	2,000	2,500	30	106	Solid	36x2½	38x3	3	4.0x5.0		2 Cycle	Sep't			Air	
Brockway, C.	2,500	2,500	30	106	Solid	36x2½	38x3	3	4.0x5.0		2 Cycle	Sep't			Air	
Brockway, D.	4,000	3,800	30	112	Solid	36x3	38x4	3	4.5x5.0		2 Cycle	Sep't			Air	
Brooks, A, B, C.	800	900	22	87	Solid	38x1½	40x1½	2	3.7x3.7		2 Cycle	Sep't			Air	
Brown, 1,500 lb.	1,500			122	Opt	Opt	Opt	4	3.7x5.2	22.5	L Head	Block	Left	Gear	Pump	Springs
Bucklen, A.	1,500	2,500		120	Solid	32x4	32x4	4	4.5x5.0	32.4	L Head	Pairs.	Left	Spiral	Thermo	Springs
Bucklen, B.	3,000	3,600		145	Solid	36x3½	37x5	4	4.5x5.0	32.4	L Head	Pairs.	Left	Spiral	Thermo	Springs
Bucklen, C.	6,000	4,500		160	Solid	36x5	37x7	4	4.5x5.0	32.4	L Head	Pairs.	Left	Spiral	Thermo	Springs
Cameron, 1 ton.	2,000	2,725	19	108	Solid	36x2½	36x2½	4	3.8x3.7	24.0	Straight	Sep't	Head	Gear	Air	
Cameron, 1 ton.	2,000	2,725	19	108	Solid	36x2½	36x2½	4	3.8x3.7	24.0	Straight	Sep't	Head	Gear	Air	
Cameron	800	1,318	17½	104	Solid	30x3½	30x3½	4	3.8x3.7	24.0	Straight	Sep't	Head	Gear	Air	
Cass, 1 ton	2,500	3,200		119	Solid	35x3½	35x4	4	4.0x4.5	25.6	L Head	Block	Right	Gear	Thermo	Trunnions
Cass, 2 ton	5,000	5,000		137	Solid	35x3½	39x3½	4	4.2x5.0	28.9	Straight	Sep't	Head	Gear	Pump	Trunnions
Chase, M†	500	1,400	25	84	Solid	34x2	36x2	2	4.1x4.0		2 Cycle	Sep't			Air	
Chase, D†	1,000	1,920	32	100	Solid	34x2	36x2	3	4.1x4.0		2 Cycle	Sep't			Air	
Chase, H†	2,000	2,300	45	106	Solid	34x2½	36x3	3	4.1x4.0		2 Cycle	Sep't			Air	
Chase, K†	2,000	2,600	45	106	Solid	34x2½	36x3	3	4.1x4.0		2 Cycle	Sep't			Air	
Chase, L†	3,000	3,200	50	112	Solid	36x3	36x3½	3	4.5x5.0		2 Cycle	Sep't			Air	
Chase, J†	4,000	3,900	52	120	Solid	36x3½	36x4	3	4.5x5.0		2 Cycle	Sep't			Air	
Cino, 440-D	1,500	2,300		120	Solid	35x4½	35x4½	4	4.5x5.0	32.4	T Head	Block	Opp	Gear	Pump	Springs
Clark, C	3,000	3,000	25	100	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, D.	3,000	3,400	25	100	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, E.	3,000	3,400	25	120	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Clark, E.	3,000	3,400	25	140	Solid	36x3½	36x4	4	3.7x5.0	22.5	L Head	Block	Left	Gear	Thermo	Springs
Coleman, 1 ton	2,000	3,400		110½	Solid	36x3	36x4	4	3.6x5.3	20.3	L Head	Block	Left	Hel'l	Thermo	Springs
Coleman, 2 ton	4,000	4,000		110½	Solid	36x3½	36x5	4	3.6x5.3	20.3	L Head	Block	Left	Hel'l	Thermo	Springs
Continental, AE	3,000	3,000	31		Solid			4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Continental, AE	2,000	3,000		120	Solid			4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	
Couple Gear, HC*	7,000	7,500	28	144	Solid*	36x4	36x4	4	5.3x6.0	44.1	T Head	Sep't	Opp	Gear	Pump	Springs
Couple Gear, AC*	10,000	8,000	28	144	Solid*	36x5	36x5	4	5.8x6.0	53.0	T Head	Sep't	Opp	Gear	Pump	Springs
Crawford, 13-30.	1,200	2,400	25	112	Solid	32x3	33x4	4	4.3x4.5	28.9	L Head	Pairs.	Right	Spi'l	Pump	
Crescent, 1 ton	2,000	3,600		108	Solid	34x3½	34x3½	4	4.1x4.3	27.3	L Head	Sep't	Left		Pump	Springs
Crescent, 2 ton	4,000	4,000		126	Solid*	34x4	34x3½	4	4.5x5.0	32.4	L Head	Sep't	Left		Pump	Springs
Crescent, 3 ton	6,000	5,000		136	Solid*	36x5	36x4	4	4.8x5.0	36.1	L Head	Sep't	Left		Pump	Springs
Crown, A	1,500	2,400		104	Solid	36x2½	36x2½	4	3.8x4.5	22.5	T Head	Sep't	Opp	Gear	Thermo	Trunnions
Crown, B	2,000	2,600		116	Solid	36x3	36x3½	4	4.0x4.5	25.6	T Head	Block	Opp	Gear	Thermo	Trunnions
Crown, C.	3,000	3,400		130	Solid	36x3½	36x4	4	4.1x5.0	27.3	T Head	Block	Opp	Gear	Opt.	Trunnions
Croxton, 10.				121		36x4	36x4	4	4.1x5.5	27.3	L Head	Block	Right	Gear	Thermo	
Dart								4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Dart	3,000	3,400	30	130	Solid	34x3½	38x3½	4	4.1x5.5	27.3	L Head	Block	Left	Hel'l	Pump	Springs
Day Utility, D.				115	Pneu.	34x4	34x4	4	4.0x4.5	25.6	L Head	Pairs.	Left	Gear	Pump	
Decatur, H.	3,000	4,000	50	129	Pneu.	34x4½	34x4½	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Detroit, Mark 111	1,000	1,700	39	100	Solid	32x2	32x2½	4	3.3x3.4	16.9	L Head	Pairs.	Left	Gear	Thermo	
Diamond, T. J.	3,000							4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Diamond, T. G.	6,000							4	5.0x5.5	40.0	L Head	Pairs.	Left	Gear	Pump	Springs
Diamond, T. G.	10,000							4	5.0x5.5	40.0	L Head	Pairs.	Left	Gear	Pump	Springs
Dispatch, L.	1,000	1,200	30	120	Opt			4	3.5x5.0		2 Cycle	Sep't			Air	
Dispatch, N.	1,000	1,200	30	120	Pneu.	36x3½	36x3½	4	3.5x5.0		2 Cycle	Sep't			Air	
Dayton, H.	4,000	4,850	23	118½	Solid*	36x4	36x3	4	4.3x5.0	28.9	T Head	Pairs.	Opp	Gear	Pump	Springs
Dayton, K.	6,000	6,575	28	137	Solid*	36x5	36x4	4	4.8x5.5	36.1	T Head	Pairs.	Opp	Gear	Pump	Springs
Dayton, M.	10,000	8,650	28	148	Solid*	36x6	42x5	4	5.3x7.0	44.1	T Head	Pairs.	Opp	Gear	Pump	Springs
Dorris, H	1,500	2,650	40	130	Solid	35x4½	35x4½	4	4.4x5.0	30.6	Straight	Pairs.	Head	Gear	Pump	
Eclipse, B, 2	2,000	3,400		106	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Pairs.	Left	Gear	Pump	
Eclipse, D.	6,000	5,300		120	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs.	Left	Gear	Pump	
Elk, 2 ton.	4,000	4,000		110	Solid*	36x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Hel'l	Pump	Springs
Elk, 2 ton.	4,000	4,000		120	Solid*	36x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Hel'l	Pump	Springs
Elk, 3 ton.	6,000	5,800		124	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs.	Right	Hel'l	Pump	Springs
Elk, 3 ton.	6,000	5,800		112	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs.	Right	Hel'l	Pump	Springs
Elk, 5 ton.	10,000	8,400		142	Solid*	36x6	36x5	4	4.5x5.5	32.4	L Head	Pairs.	Right	Hel'l	Pump	Springs
Elk, 5 ton.	10,000	8,400		130	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs.	Right	Hel'l	Pump	Springs
Erving, L.	3,000			120	Solid	36x3½	36x3½	4	4.5x5.5	32.4		Pairs.			Pump	
Federal, C.	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.3x4.5	28.9	L Head	Pairs.	Left	Gear	Pump	Springs
Federal, D.	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.3x4.5	28.9	L Head	Pairs.	Left	Gear	Pump	Springs
Ford, T	750	1,200	28	100	Pneu.	30x3	30x3½	4	3.8x4.0	22.5	L Head	Block	Right	Gear	Thermo	
Fourwheel Drive, G*	3,000	4,700	23	124	Solid	36x4	36x4	4	4.3x5.0	28.9	T Head	Pairs.	Opp	Gear	Pump	Trunnions
Fourwheel Drive, B*	6,000	5,800	23	125	Solid	36x5	36x5	4	4.8x5.5	36.1	T Head	Pairs.	Opp	Gear	Pump	Trunnions
Gabriel, G†	Opt	Opt	Opt	Opt	Opt	Opt	Opt	2	5.0x4.0	20.0	L Head	Sep't	Side	Gear	Thermo	
Gabriel, H	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	3.8x5.1	22.5	L Head	Block	Side	Gear	Pump	
Gabriel, J.	Opt	Opt	Opt	Opt	Opt	Opt	Opt	4	4.1x5.3	27.3	L Head	Block	Side	Gear	Pump	
Geneva, C.	1,000	1,915		96	Solid	34x2	36x2½	2	5.1x4.5	21.0	L Head	Sep't	Side	Gear	Thermo	Springs
Geneva, B	1,200	1,915		96	Solid	34x2	36x2½	2	5.1x4.5	21.0	L Head	Sep't	Side	Gear	Thermo	Springs

\*Three wheels. †Two-cylinder opposed. \*Drives on four wheels. ††Gas-electric power plant.

**ABBREVIATIONS:**—Tires: Solid\*, solid dual tires in rear. Cylinders: Sep't, separate. Valves: Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. Camshaft Drive: Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. Cooling: Thermo, thermo-siphon. Radiator Suspension: S & T, springs and trunnions. Ignition: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Pres, splash and pressure; In Fed, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3=½, 4½=½, 2=⅞, 1=⅞, 3=⅞, 4=⅞, 5=⅞, 6=⅞, 7=⅞, 8=⅞, 9=⅞.



## Turning Radius and the Chassis Weight for 1913—Continued

IGNITION			Carburetor	Motor Lubrication	Clutch Type	TRANSMISSION				RUNNING GEAR						BEARINGS	
System	Magneto or Generator	Control				Type	Location	No. Forw'd Speeds	Gear Ratio	Final Drive	Front	Rear	Steering Wheel	Gearshift	Emergency Brake	Gearset	Rear Axle
Sing	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	3.0-1	Chain	Ell	Ell	Right	Pedal	Pedal	B R & P	Ball
Sing	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	3.0-1	Chain	Ell	Plat	Right	Pedal	Pedal	B R & P	Ball
Sing	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	8.0-1	Chain	Ell	Plat	Right	Center	Center	Roll	Ball
Sing	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3		Chain	Ell	Plat	Right	Center	Center	B R & P	Roll
Sing	Bosch		Kingston	In Fuel		Frie			14.0-1	Roller							
Dual	Remy	Hand		Splash	Disk	Sel	Unit M	3		Int G	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
Doub	Briggs	Hand	Optional	Spl-Pres	Disk	Sel	Unit M	3	4.5-1	Bevel	1/2 Ell	1/2 Ell	Left	Opt	Opt	Roll	Roll
Dual		Hand	Optional	Spl-Pres	Disk	Sel	Unit M	3	7.3-1	Chain	1/2 Ell	1/2 Ell	Left	Opt	Opt	Plain	Ball
Dual		Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3	9.3-1	Chain	1/2 Ell	1/2 Ell	Left	Opt	Opt	Plain	Roll
Sing		Hand	Kingston	Splash	Cone		Unit J	3	7.0-1	Chain	Ell	Ell	Right	Right	Right	Ball	Ball
Sing		Hand	Kingston	Spl-Pres	Cone		Unit J	3	6.0-1	Chain	Ell	Ell	Right	Right	Right	Ball	Ball
Sing		Hand	Kingston	Spl-Pres	Cone		Unit X	3	3.0-1	Bevel	1/2 Ell	Ell	Right	Right	Right	Plain	Ball
Opt	Eisemann	Hand	Kingston	Splash	Cone	Sel	Amid	2		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Plain	Roll
Opt		Hand	Kingston	Splash	Diak	Sel	Unit M	4		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Plain	Roll
Sing	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	9.0-1	Chain	Ell	Cross	Left	Pedal			Plain
Sing	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	7.6-1	Chain	Ell	Ell	Right	Pedal			Ball
Sing	Bosch	Fixed	Holley	In Fuel		Plan	Amid	2	8.1-1	Chain	Ell	Plat	Right	Pedal			Ball
Sing	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.9-1	Chain	Ell	Plat	Right	Right			Ball
Sing	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.6-1	Chain	Ell	Plat	Right	Right	Right	Roll	Ball
Sing	Bosch	Fixed	Holley	In Fuel	Cone	Sel	Amid	3	7.6-1	Chain	Ell	Plat	Right	Right	Right	Roll	Ball
Dual	Opt	Hand	Rayfield	Spl-Pres	Cone	Sel	Unit X	3		Bevel	Ell	1/2 Ell	Right	Center	Center	Ball	Ball
Dual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	1/2 Ell	Ell	Right	Right	Right	Roll	B&R
Dual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	1/2 Ell	Ell	Right	Right	Right	Roll	B&R
Dual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	1/2 Ell	Ell	Right	Right	Right	Roll	B&R
Dual	Eisemann	Auto	Holley	Splash	Opt	I. C	Amid	3	3.3-1	Bevel	1/2 Ell	Ell	Right	Right	Right	Roll	B&R
Dual	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Chain	Ell	Ell	Right	Right		Roll	Roll
Dual	Remy	Hand	Schebler	Splash	Cone	Sel	Amid	3		Chain	Ell	Ell	Right	Right		Roll	Roll
Doub	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit J	3	10.0-1	Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Ball
Dual	Bosch	Hand	Schebler	Splash	Disk	Sel	Unit J	3	10.0-1	Chain	1/2 Ell	Plat	Right	Right	Right	Ball	Ball
Dual	Mea	Fixed	Stromberg	Splash							1/2 Ell	1/2 Ell	Right		Pedal		Roll
Dual	Mea	Fixed	Stromberg	Splash							1/2 Ell	1/2 Ell	Right	Pedal	Pedal		Roll
Dual	Remy	Hand	Stromberg	Spl-Pres	Cone	Sel	Unit X	3	4.0-1	Bevel	1/2 Ell	Ell	Right	Right	Right	Roll	Roll
Opt			Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
Opt			Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
Opt			Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	Ell	Ell	Right	Center	Pedal	Roll	Roll
Dual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	7.1-1	Chain	1/2 Ell	Ell	Left	Center	Center	Plain	Ball
Dual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	7.1-1	Chain	1/2 Ell	Ell	Left	Center	Center	Plain	Ball
Dual	Briggs	Hand		Spl-Pres	Disk	Sel	Amid	3	8.0-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Plain	Ball
Sing	Eisemann	Hand	Schebler	Splash	Disk	Sel		3	3.50-1	Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
Sing	Eisemann	Fixed	Optional	Splash	Cone	Sel		3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Plain
Dual	Eisemann	Gov	Stromberg	Spl-Pres	Opt	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Doub	Remy	Hand	Schebler	Splash	Disk	Pro		3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Sing	Bosch	Hand	Rayfield	Splash	Disk	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Plain	Roll
Sing		Fixed		Spl-Pres		Plan	Amid	2	6.0-1	Chain	1/2 Ell	Ell	Left	Center	Center		Roll
Dual	Bosch	Fixed	Rayfield	Splash	Disk	Sel	Unit M	3		Worm	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3		Worm	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Amid	3	12.9-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Opt	Hand	Maco	Splash		Frie	Amid		6.3-1	Chain	Ell	Ell	Right	Pedal	Right	Roll	Roll
Dual	Opt	Hand	Maco	Splash		Frie	Amid		6.3-1	Chain	Ell	Ell	Right	Pedal	Right	Roll	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	9.2-1	Chain	1/2 Ell	Ell	Left	Center	Center	Roll	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	9.4-1	Chain	1/2 Ell	Ell	Left	Center	Center	Roll	Roll
Doub	Bosch	Hand	Stromberg	Pressure	Disk	Sel	Amid	3	12.0-1	Chain	1/2 Ell	Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Hand	Stromberg	Splash	Disk	Sel	Unit M	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	1/2 Ell	Ell	Right			Plain	Ball
Dual	Bosch	Hand	Stromberg	Spl-Pres	Cone	Sel	Amid	3		Chain	1/2 Ell	Plat	Right			Plain	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand	Schebler	Spl-Pres	Disk	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Eisemann	Hand															



# Specifications American Commercial Cars, Including Horsepower.

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
Gleason, 10 $\frac{1}{2}$	1,000	1,500		96	Solid	36x2	36x2	2	4.8x4.0	18.0	L Head	Sep't	Left	Gear	Thermo	
G. M. C., VC	2,500		38	126	Solid	34x3	36x4	4	3.5x5.3	19.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., VC	2,500		38	148	Solid	34x3	36x4	4	3.5x5.3	19.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., SC	4,000			142	Solid*	34x4	36x3 $\frac{1}{2}$	4	4.0x6.0	25.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., SC	4,000			175	Solid*	34x4	36x3 $\frac{1}{2}$	4	4.0x6.0	25.6	L Head	Block	Right	Gear	Pump	Springs
G. M. C., H	7,000	6,500	50	170	Opt	36x5	36x4	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., HL	7,000	6,950	60	170	Solid*	36x5	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., K	10,000	7,600	50	Opt	Solid*	36x6	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
G. M. C., KL	10,000	8,100	60	170	Solid*	36x6	36x6	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear	Pump	
Gramm, 1 ton	2,000	3,830	20	106	Solid	34x3 $\frac{1}{2}$	34x3 $\frac{1}{2}$	4	4.3x4.5	28.9	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 2 ton	4,000	4,500	22	116	Solid*	36x4	36x3	4	4.3x4.5	28.9	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 3 ton	6,000	6,830	24	124	Solid*	36x5	36x4	4	5.0x5.0	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Gramm, 5 ton	10,000	8,140	28 $\frac{1}{2}$	130	Solid*	36x5	40x5	4	5.0x5.0	40.0	L Head	Pairs	Right	Gear	Pump	Springs
Gramm-Bernstein, 2 ton				Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Gramm-Bernstein, 3 $\frac{1}{2}$ ton	7,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Great Eagle, A				138	Solid	36x4 $\frac{1}{2}$	36x4 $\frac{1}{2}$	4							Pump	
Handy, Wagon	500		12	65	Solid	1.1 $\frac{1}{2}$	1.1 $\frac{1}{2}$	2	3.8x3.8		2 Cycle	Sep't		Gear	Air	
Handy, Wagon	800		17	86	Solid	1.4	1.4	2	4.1x3.8		2 Cycle	Sep't		Gear	Air	
Hart-Kraft, B $\frac{1}{2}$	1,000				Solid	34x2 $\frac{1}{2}$	34x2 $\frac{1}{2}$	2	4.5x4.0	16.2	L Head	Sep't	Side	Gear	Thermo	
Hart-Kraft, B $\frac{1}{2}$	1,500				Solid	34x3	34x3	2	4.5x4.0	16.2	L Head	Sep't	Side	Gear	Thermo	
Hart-Kraft, B $\frac{1}{2}$	1,500			114	Solid	34x3	34x3 $\frac{1}{2}$	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	
Hart-Kraft, C	2,000			121 $\frac{1}{2}$	Solid	34x3 $\frac{1}{2}$	36x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	
Hart-Kraft, C	3,000			127	Solid	34x3 $\frac{1}{2}$	36x5	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	
Hart-Kraft, H	4,000			133	Solid*	34x4	36x3	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	
Hart-Kraft, D	5,000			140	Solid*	34x4	38x3 $\frac{1}{2}$	4	4.5x5.5	32.4	L Head	Pairs	Right	Gear	Pump	
Hatfield, J	1,000	1,700	27	88	Solid	34x2	34x2	3	4.1x4.0		2 Cycle	Sep't			Air	
Hatfield, K	Opt	Opt	Opt	Opt	Opt	Opt	Opt	3	4.1x4.0		2 Cycle	Sep't			Air	
Hercules, E	2,000	2,800	43	110	Solid	36x3 $\frac{1}{2}$	36x3 $\frac{1}{2}$	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Hewitt	2,000							4	4.3x6.0	28.9						
Hupmobile, HT	800	1,430		106	Pneu	32x3 $\frac{1}{2}$	33x4	4	3.3x5.5	16.9	L Head	Block	Left	Chain	Thermo	
Ideal, I	1,500	2,800		109	Solid	36x3	36x3 $\frac{1}{2}$	4	3.5x4.5	19.6	L Head	Pairs	Left	Gear	Thermo	Springs
Ideal, H	2,000	3,000		115	Solid	36x3	36x4	4	3.5x4.5	19.6	L Head	Pairs	Left	Gear	Thermo	Springs
Ideal, H-2	2,000	3,500		124	Solid	36x3 $\frac{1}{2}$	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Ideal, G	3,000	4,000		124	Solid	36x4	36x5	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
I. H. C., A $\frac{1}{2}$	1,000	1,997		90	Solid	38x2 $\frac{1}{2}$	38x2	2	5.0x5.0	20.0	Straight	Sep't	Head	Gear	Air	
I. H. C., M $\frac{1}{2}$		2,047		Opt	Opt	Opt	Opt	2	5.0x5.0	16.2	Straight	Sep't	Head	Gear	Pump	Springs
Indiana, A	3,000	3,320		135	Solid	34x3 $\frac{1}{2}$	34x4	4	4.0x4.0	25.6		Sep't	Right	Gear	Pump	
Indiana, 2 ton	4,000	4,500		144	Solid*	36x4	36x3 $\frac{1}{2}$	4	4.1x5.3	27.3		Sep't	Right	Gear	Pump	
Indiana, 3 ton	6,000	6,000		160	Solid*	36x4 $\frac{1}{2}$	40x4	4	4.8x5.0	36.1		Sep't	Right	Gear	Pump	
Jarvis, 2 ton	4,000	3,700		120	Solid*	36x4	36x3 $\frac{1}{2}$	4	4.0x6.0	25.6	Straight	Sep't	Head	Chain	Pump	Springs
Jarvis, 3 $\frac{1}{2}$ ton	7,000	5,800		128	Solid*	36x5	36x4	4	4.0x6.0	25.6	Straight	Sep't	Head	Chain	Pump	Springs
Jarvis, 5 ton	10,000	7,500		144	Solid*	36x6	38x5	4	4.0x6.0	25.6	Straight	Sep't	Head	Chain	Pump	Springs
Johnson, A		2,000		100	Solid	34x3 $\frac{1}{2}$	34x3 $\frac{1}{2}$	4	4.3x4.5	28.9	L Head	Pairs	Left	Gear	Pump	
Johnson, B		4,000		108	Solid	36x4	36x4	4	4.5x5.3	32.4	L Head	Pairs	Side	Gear	Pump	
Johnson, C		8,000		132	Solid*	36x5	36x3 $\frac{1}{2}$	4	5.0x5.5	40.0	L Head	Pairs	Side	Gear	Pump	
Kadix, C	6,000	5,800		148	Solid*	37x5	41x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, C	6,000	5,900		166	Solid*	37x5	41x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, D	8,000	6,200		148	Solid*	37x5	41x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, D	8,000	6,300		166	Solid*	37x5	41x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, E	10,000			148	Solid*	42x6	42x6	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Kadix, E	10,000			166	Solid*	42x6	42x6	4	5.0x5.8	40.0	L Head	Pairs	Left	Gear	Pump	Springs
Kato, H		6,000		120	Solid	34x5	34x5	4	4.8x5.0	36.1	L Head	Pairs	Side	Gear	Pump	
Kearns, A	1,500	1,400		100	Solid	34x2	34x2	3	4.0x4.0		2 Cycle	Sep't	2 Cycle		Air	
Kelly, K-30	3,000	3,400		120	Solid	36x3 $\frac{1}{2}$	36x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Kelly, K-40	7,000			150	Solid	38x5	42x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
King, 3	7,000	5,950		120	Solid*	36x6	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Spil	Pump	Springs
Kisselkar	1,500	2,500	22	120	Opt	Opt	Opt	4	4.3x4.3	28.9	L Head	Pairs	Left	Chain	Pump	
Kisselkar	2,000	3,000	24	132	Opt	Opt	Opt	4	4.5x5.3	32.4	L Head	Pairs	Left	Chain	Pump	
Kisselkar	4,000	4,500	25	140	Solid*	36x4	36x3 $\frac{1}{2}$	4	4.5x5.3	32.4	L Head	Pairs	Left	Chain	Pump	
Kisselkar	6,000	5,300	25	144	Solid*	36x4	36x4	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kisselkar	8,000	5,700	26	156	Solid*	37x5	37x5	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Kisselkar	10,000	6,000	26	156	Solid*	37x5	37x6	4	4.9x5.0	38.0	L Head	Pairs	Left	Chain	Pump	
Klinekar, 2-16 $\frac{1}{2}$		1,250		86	Solid	36x3	36x3	2							Thermo	
Knickerbocker, 3	6,000			118	Opt	Opt	Opt	4	4.5x5.0	32.4	L Head	Sep't	Left	Gear	Pump	Springs
Knickerbocker, 3	6,000			148	Opt	Opt	Opt	4	4.5x5.0	32.4	L Head	Sep't	Left	Gear	Pump	Springs
Knickerbocker, 5	10,000			130	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep't	Left	Gear	Pump	Springs
Knickerbocker, 5	10,000			148	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep't	Left	Gear	Pump	Springs
Knox, R 3	4,000	4,800		145	Opt	Opt	Opt	4	5.0x5.5	40.0	Straight	Sep't	Head	Gear	Pump	Springs
Knox, R 15	6,000	7,500		149	Solid*	36x5	36x5	4	5.0x4.8	40.0	Straight	Sep't	Head	Gear	Pump	Springs
Koehler $\frac{1}{2}$	1,600	2,000	40	86	Solid	34x2	34x2	2	5.3x4.0	22.0	L Head	Sep't	Side	Gear	Thermo	Springs
Kopp, H	3,000			120	Solid	36x4	36x5	4	4.3x4.5	28.9	T Head	Pairs	Opp	Gear	Pump	
Kopp, L	6,000			116	Solid	36x5	36x4	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	
Kopp, M	10,000			126	Solid	36x6	36x5	4	5.3x6.0	44.1	T Head	Sep't	Opp	Gear	Pump	
Krebs, A	1,500	2,300	20	100	Solid	34x3	34x3	2	4.5x5.0		2 Cycle	Block			Thermo	
Krebs, B	1,500	2,300	20	100	Solid	34x3	34x3	2	4.5x5.0		2 Cycle	Block			Thermo	

†Three wheels. ††Two-cylinder opposed. \*Drives on four wheels. †††Gas-electric power plant.

ABBREVIATIONS:—Tires: Solid\*, solid dual tires in rear. Cylinders: Sep't, separate. Valves: Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. Camshaft Drive: Gear, spur gears; Hel'l, helical gears; Spl'l, spiral gears. Cooling: Thermo, thermo-siphon. Radiator Suspension: S & T, springs and trunnions. Ignition: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3=4 $\frac{1}{2}$  etc., 2= $\frac{1}{2}$ , 1= $\frac{1}{2}$ , 3= $\frac{1}{2}$ , 4= $\frac{1}{2}$ , 5= $\frac{1}{2}$ , 6= $\frac{1}{2}$ , 7= $\frac{1}{2}$ , 8= $\frac{1}{2}$ , 9= $\frac{1}{2}$ .



**ABBREVIATIONS:**—Clutch: Exp B, expanding band; Con B, contracting band. Gearset: Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. Gearset Location: Amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. Drive: Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. Springs:  $\frac{1}{2}$  Ell, semi-elliptic; Ell, elliptic;  $2\frac{1}{2}$  Ell,  $\frac{1}{2}$  elliptic; Plat, platform. Bearings: Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B & R & P, ball roller and plain.



# Specifications American Commercial Cars, Including Horsepower,

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
LaFrance, 6 ton	12,500	9,000	22½	143	Solid*	36x5	38x6	4	5.5x6.0	48.4	T Head	Pairs	Right	Gear	Pump	Springs
Lambert	1,500			114	Solid	33x4	33x4	4	3.5x4.3	19.6	L Head	Pairs	Right	Gear	Pump	Springs
Lambert, 1 ton	2,000	3,200		114	Solid	36x3	36x3	4	4.1x4.5	27.3	L Head	Block	Right	Gear	Pump	Springs
Lambert, 2 ton	4,000				Solid	36x3½	36x4	4	4.1x4.5	27.3	L Head	Block	Right	Gear	Pump	Springs
Lange, C	2,000	4,100		125	Solid	36x3½	38x4	4	3.8x5.3	22.5	L Head	Block	Left	Hel'l	Thermo	Springs
Lange, D	3,000	4,400		125	Solid*	36x3½	38x5	4	4.1x5.3	27.3	L Head	Block	Left	Hel'l	Thermo	Springs
Lange, B	4,000	4,800		136	Solid	36x4	38x3	4	4.1x5.3	27.3	L Head	Block	Left	Hel'l	Thermo	Springs
Lauth-Juergens, K	2,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Lauth-Juergens, L	4,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Lauth-Juergens, M	6,000			Opt	Opt	Opt	Opt	4	4.8x5.0	36.1	L Head	Sep'rt	Left	Gear	Pump	Springs
Lewis, 21	5,000	5,200	30	144	Solid	34x4	36x3½	4	4.3x5.0	28.9	T Head	Pairs	Opp	Gear	Pump	Springs
Lewis, 51	10,000	7,600	30	144	Solid*	36x6	38x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Lewis, 51L	10,000	7,600	30	168	Solid*	36x6	38x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Lincoln, 27 & 29½	800			87	Pneu	34x3½	34x3½	2	4.1x4.0	13.6	L Head	Sep'rt	Side	Gear	Air	
Lippard-Stewart	1,500	2,500	17	115	Solid	35x4½	35x4½	4	3.8x5.3	22.5	L Head	Block	Left	Hel'l	Pump	Springs
Little Giant, D	2,000	2,100	16	91	Solid	34x2	34x2½	2	5.0x4.0	20.0	L Head	Sep'rt	Head	Gear	Thermo	
Locomobile, A	10,000			Opt	Opt	Opt	Opt	4	5.0x6.0	40.0	T Head	Pairs	Opp	Gear	Pump	Rubber
Longest, 3A	8,000			144	Solid*	36x5	36x5	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Longest, 3A	8,000			172	Solid*	36x5	36x5	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Lord Baltimore, C	2,000	3,800		130	Solid	34x4	36x4	4	3.8x5.0	22.5	L Head	Block	Left	Gear	Pump	
Lord Baltimore, B	4,000	4,200		135	Solid*	34x4	36x3	4	3.8x5.0	22.5	L Head	Block	Left	Gear	Pump	
Lord Baltimore, A	6,000	7,000		130	Solid*	34x4	38x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Lord Baltimore, E	8,000	7,800		135	Solid*	36x5	42x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Lord Baltimore, F	10,000	8,400		140	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	
Luck Utility	1,000			115	Solid			4	3.3x4.0	16.9	L Head	Block	Right	Gear	Thermo	
Mack, 1 ton	2,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 1½ ton	3,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 2 ton	4,000			Opt	Solid*			4	4.5x5.5	32.4	L Head	Pairs	Right		Pump	
Mack, 3 ton	6,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 4 ton	8,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 5 ton	10,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mack, 7 ton	14,000			Opt	Solid*			4	5.5x6.0	48.4	L Head	Pairs	Right		Pump	
Mais, 1½ ton	3,000		19	119	Solid	36x3½	36x5	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Mais, 2 ton	4,000		21	132	Solid*	36x3½	36x3½	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Mais, 3 ton	6,000		23	160	Solid*	36x4	36x4	4	4.0x5.3	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
Marmon, Delivery	1,500	2,350	40	120	Solid	32x4	32x4	4	4.0x5.0	25.6	T Head	Pairs	Opp	Hel'l	Pump	Trunnions
Mason, 12 ft	1,000	1,500	20	96	Solid	32x3½	32x3½	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
Mason, 12 ft	1,200	1,500	20	96	Solid	32x3½	32x3½	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
Mason, 10-13 ft	1,600	1,500	20	96	Solid	33x4	33x4	2	5.0x5.0	20.0	Straight	Sep'rt	Head	Gear	Pump	
McIntyre, E	1,500	2,800	20	118	Solid	34x3	34x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, A	3,000	3,600	34	144	Solid*	34x3½	36x3	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, B	3,000	3,600	34	120	Solid	34x3	34x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	Springs
McIntyre, G	6,000	5,000	28	144	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Spr'l	Thermo	Springs
McIntyre, G	6,000	5,000	28	168	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Spr'l	Thermo	Springs
Menominee, A	1,500	2,500	20	112	Solid	32x3	32x3	4	3.8x4.5	22.5	L Head	Pairs	Left	Gear	Pump	
Menominee, B	2,000	2,850	22	122	Solid	34x3	34x3	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	
Mercury, P ft	1,000	1,400		85	Solid	38x2½	40x2½	2	4.3x4.0	14.5	L Head	Sep'rt	Head	Gear	Air	
Modern, B, Bx	1,000	2,200	36	114	Opt	Opt	Opt	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Modern, BR	1,000	2,200	36	114	Opt	Opt	Opt	4	3.8x4.5	22.5	L Head	Block	Right	Gear	Thermo	Springs
Modern, A, AX	1,500	2,280	47	120	Solid	36x3	36x3½	4	4.3x5.3	30.3	L Head	Block	Right	Gear	Pump	
Mogul, G	4,000	4,600		120	Solid	36x4	36x5	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Mogul, O	8,000	4,600		142	Solid	36x6	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Mogul, M	10,000	10,000		154	Solid	36x6	40x6	4	5.3x5.8	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Mogul, V	10,000	11,000		188	Solid	36x7	40x6	4	5.3x5.8	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Monitor, D	2,000	2,850		100	Solid	34x3½	34x3½	4	3.8x5.0	22.5	L Head	Pairs	Left	Gear	Thermo	Springs
Monitor, C ft	2,000	2,850	40	100	Solid	34x3½	34x3½	2	3.8x4.8	22.0	L Head	Sep'rt	Left	Gear	Thermo	Rubber
Monitor, E	3,000	4,000		110	Solid	36x3½	40x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Moore, C	1,500	1,800		102	Solid	36x2½	36x3	3	4.0x4.0		2 Cycle	Sep'rt		Gear	Air	
Moore, 2 ton	4,000	4,000		140	Solid*	36x4	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Moore, 3 ton	6,000	6,500		141	Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Moore, 4 ton	8,000	7,200		153	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Moore, 5 ton	10,000	9,000		158	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Mora, 20 ft	1,500	2,140	32	94	Solid	36x2	36x2½	2	4.5x4.5	16.2	L Head	Sep'rt		Gear	Thermo	
Moreland, B	2,000			Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Moreland, E	4,000			Opt	Opt	Opt	Opt	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Moreland, 13F	6,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Motorette, L1½	400	670	20	72	Pneu	28x3	29x3½	2	3.8x3.8	11.3	L Head	Sep'rt	Side	Gear	Thermo	
Motorette, N1½	500			72	Pneu	28x3	29x3½	2	3.8x3.8	11.3	L Head	Sep'rt	Side	Gear	Thermo	
Natco, 15		2,700	34	104	Solid	36x3½	36x3½	4	3.5x5.0	19.6	L Head	Block	Right	Gear	Thermo	Springs
Nelson-LeMoon, D1	2,000	3,200		Opt	Solid*	36x3	36x4	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Pump	Springs
Nelson-LeMoon, D2	4,000	4,500		Opt	Solid*	36x4	36x4	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Nelson-LeMoon, D3	6,000	6,500		Opt	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Block	Right	Gear	Pump	Springs
Nyberg	3,000	3,000		Opt	Opt	Opt	Opt	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Old Reliable, 2	6,000	4,500		120	Solid	34x4	Opt	4	4.3x5.0	28.9	T Head	Pairs	Opp	Hel'l	Pump	S & T
Old Reliable, B	10,000	7,300		126	Solid*	36x6	36x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Hel'l	Pump	S & T

†Three wheels. ††Two-cylinder opposed. \*Drives on four wheels. †††Gas-electric power plant.

**ABBREVIATIONS:**—Tires: Solid\*, solid dual tires in rear. Cylinders: Sep'rt, separate. Valves: Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. Camshaft Drive: Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. Cooling: Thermo, thermo-siphon. Radiator Suspension: S & T, springs and trunnions. Ignition: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3=4½ etc., 2=2, .1=1, 3=3, 4=4, 5=5, 6=6, 7=7, 8=8, 9=9.



## Turning Radius and the Chassis Weight for 1913—Continued

IGNITION			Carburetor	Motor Lubrication	TRANSMISSION					RUNNING GEAR					BEARINGS		
System	Magneto or Generator	Control			Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL			Gearset	Rear Axle
						Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gearshift	Emergency Brake		
Dual	Bosch	Hand	Schebler	Spl-Pres		Fric				Chain	1/2 Ell	1/2 Ell	Right		Right		Roll
Dual	Bosch	Hand	Schebler	Spl-Pres		Fric				Chain	1/2 Ell	1/2 Ell	Right	Right	Right		Ball
Dual	Remy	Hand	Schebler	Spl-Pres		Fric	Unit M			Chain	1/2 Ell	1/2 Ell	Right	Right	Right		Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Roller	1/2 Ell	1/2 Ell	Left	Center	Center	R & R	Roll
Doub	Bosch	Hand	Stromberg	Spl-Pres	Disk	I. C.	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	B & R	Roll
Doub	Opt	Hand	Stromberg	Splash	Disk	Sel	Amid	4	7.2-1	Chain	1/2 Ell	1/2 Ell	Right			Ball	Ball
Doub	Opt	Hand	Stromberg	Splash	Disk	Sel	Amid	4	5.6-1	Chain	1/2 Ell	1/2 Ell	Left			Ball	Ball
Doub	Opt	Hand	Stromberg	Splash	Disk	Sel	Amid	4	7.2-1	Chain	1/2 Ell	1/2 Ell	Right			Plain	Ball
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	8.5-1	Chain	1/2 Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	9.7-1	Chain	1/2 Ell	Plat	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Rayfield	Pressure	Disk	Sel	Amid	3	9.7-1	Chain	1/2 Ell	Plat	Right	Right	Right	Ball	Roll
Sing	K. W.		Schebler	Splash		Fric				Chain	Ell	Ell	Left	Left			Roll
Sing	Eisemann	Auto	Rayfield	Splash	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Spl'd'rf.	Hand	Schebler	Pressure	Disk	Plan	Amid	2	8.5-1	Chain	1/2 Ell	Ell	Right	Right	Right	B & R	Ball
Dual	Fixed	Own	Own	Pressure	Disk	Sel	Amid		10.3-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Pressure	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Plain	Roll
Dual	Bosch	Hand	Schebler	Pressure	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Plain	Roll
Sing	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit M	3		Int G.	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
Sing	Bosch	Hand	Schebler	Splash	Cone	Sel	Unit M	3		Int G.	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
Dual	Eisemann	Gov	Holley	Pressure	Cone	Sel	Amid	3	8.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Holley	Pressure	Cone	Sel	Amid	3	9.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual	Eisemann	Auto	Holley	Pressure	Cone	Sel	Amid	3	9.8-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual	Opt	Hand	Opt	Spl-Pres		Plan		2		Bevel	1/2 Ell	1/2 Ell	Right	Pedal	Pedal	B & R	Ball
Dual	Gov		Stromberg	Pressure	Disk	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Dual	Gov		Stromberg	Pressure	Disk	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Dual	Gov		Stromberg	Pressure	Disk	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Opt	Bosch	Gov	Opt	Pressure	Cone	Sel		3		Chain	1/2 Ell	Plat				Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G.	1/2 Ell	1/2 Ell	Left	Left	Left	Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G.	1/2 Ell	1/2 Ell	Left	Left	Left	Ball	Roll
Sing	Eisemann	Auto	Rayfield	Splash	Exp Bd	Pro	Unit M	3	7.8-1	Int G.	1/2 Ell	1/2 Ell	Left	Left	Left	Ball	Roll
Dual	Bosch	Hand	Stromberg	Pressure	Cone	Sel	Unit X	3		Bevel	1/2 Ell	Ell	Right	Right	Right	Ball	Ball
Dual	Spl'd'rf.	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	1/2 Ell	Ell	Right	Pedal	Right	Plain	Roll
Dual	Spl'd'rf.	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	1/2 Ell	Ell	Right	Pedal	Right	Roll	Roll
Dual	Spl'd'rf.	Hand	Schebler	Spl-Pres	Cone	Plan	Unit M	2		Chain	1/2 Ell	Ell	Right	Pedal	Right	Plain	Roll
Dual		Hand	Schebler	Splash	Cone	Sel	Amid	3	6.4-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.1-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	8.1-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Ball
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	4.0-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Roll
Dual		Hand	Stromberg	Splash	Disk	Sel	Unit M	3	4.0-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Roll
Dual		Hand	Schebler	Pressure	Disk	Sel	Unit M	3		Bevel	1/2 Ell	Plat	Right	Center	Center	Ball	B & R
Dual		Hand	Schebler	Pressure	Disk	Sel	Unit M	3		Bevel	1/2 Ell	Plat	Right	Center	Center	Ball	Ball
Sing	Remy	Fixed	Own	Spl-Pres	Disk	Plan	Unit M	2		Chain	Ell	Ell	Right	Right	Right		Roll
Sing	Opt	Hand	Opt	Splash	Cone	Sel	Unit J	3	6.5-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Sing	Opt	Hand	Opt	Splash	Cone	Sel	Unit J	3	6.5-1	Bevel	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Sing	Opt	Hand	Opt	Splash	Cone	Sel	Unit J	3	6.5-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Sing	Mea	Hand	Stromberg	Splash	Disk	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Doub	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Doub	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Doub	Mea	Hand	Stromberg	Splash	Disk	Pro	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Sing	Bosch	Hand	Stromberg	Spl-Pres	Disk	Sel	Unit M	3		Bevel	1/2 Ell	Ell	Right	Center	Center	Ball	B & R
Doub	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Bevel	1/2 Ell	Ell	Right	Right	Right	Roll	B & R
Sing	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3	8.2-1	Chain	1/2 Ell	Plat	Right	Right	Right	Ball	Ball
Sing	Bosch	Fixed	Own	In-Fuel	Disk	Plan	Amid	2	5.5-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Schebler	Spl-Pres	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Sing	Fixed		Spl-Pres	Disk	Plan	Amid		2	6.8-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Left	Pedal	Pedal	Plain	Ball
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Spl-Pres	Cone	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Sing	Bosch	Fixed	Holley	Splash	Cone	Plan	Unit M	2	9.0-1	Chain	Ell	1/2 Ell	Right	Right	Pedal	Plain	Ball
Sing	Bosch	Fixed	Holley	Splash	Cone	Plan	Unit M	2	9.0-1	Chain	Ell	1/2 Ell	Right	Right	Pedal	Plain	Ball
Sing			Pressure	Cone	Sel	Unit J		3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Sing	Fixed		Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Bosch	Hand	Rayfield	Splash	Disk	Sel	Unit M	3	Opt	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Roll	Roll
Dual	Remy	Hand	Opt	Splash	Diak	Sel	Unit M	3	9.0-1	Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Schebler	Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Schebler	Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. Gearset: Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. Gearset Location: Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. Drive: Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. Springs: 1/2 Ell, semi-elliptic; Ell, elliptic; 3/4 Ell, 3/4 elliptic; Plat, platform. Bearings: Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball roller and plain.



# Specifications American Commercial Cars, Including Horsepower,

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
Oliver, A††	1,500	2,500		102	Solid	34x3	34x3½	2	5.0x5.0	20.0	L Head	Sep't	Top	Gear	Thermo	Springs
Oliver, B	3,000			133	Solid*	36x3½	36x3	4								
Overland, 69 T	800	1,900	19	110	Solid	33x4	33x4	4	4.0x4.3	25.6	L Head	Sep't	Left	Gear	Thermo	Trunnions
Packard, 2 ton	4,000			Opt	Opt	Opt	Opt	4	4.1x5.1	26.4	T Head	Pairs	Opp	Gear	Pump	Springs
Packard, 3 ton	6,000			Opt	Opt	Opt	Opt	4	4.5x5.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Packard, 4 ton	10,000			Opt	Opt	Opt	Opt	4	5.0x5.5	40.0	T Head	Pairs	Opp	Gear	Pump	Springs
Packers, D	4,000	4,300		130	Solid	36x3½	36x5	4	4.3x4.5	28.9	T Head	Pairs	Opp	Gear	Pump	
Packers, E	8,000	6,800		150	Solid*	36x5	36x5	4	5.3x6.0	44.1	T Head	Sep't	Opp	Gear	Pump	
Palmer	1,500			110	Solid	34x2½	34x3½	4	3.6x4.8	20.3	L Head	Pairs	Right		Pump	
Pathfinder	1,500	2,300	25	120	Solid	35x4½	35x4½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Thermo	
Peerless, T C	6,000	6,200	25	151	Solid*	36x4	40x4	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	6,000	6,500	27	174	Solid*	36x4	40x4	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	8,000	6,900	25	151	Solid*	36x5	40x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	8,000	7,200	27	174	Solid*	36x5	40x5	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	10,000	7,600	25	151	Solid*	38x6	42x6	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	10,000	8,000	27	174	Solid*	38x6	42x6	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	12,000	8,200	25	151	Solid*	38x7	42x7	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Peerless, T C	12,000	8,600	27	174	Solid*	38x7	42x7	4	4.5x6.5	32.4	T Head	Pairs	Opp	Gear	Pump	Springs
Pierce-Arrow	10,000			Opt	Solid	Opt	Opt	4	4.9x6.0	38.0	T Head	Pairs	Opp	Gear	Pump	Trunnions
Piggins, 1 ton	2,000	3,800	20	115	Solid	3½	4	4	4.3x4.8	28.9	L Head	Pairs	Left	Gear	Pump	
Plymouth, D-2	2,000	1,000		98	Solid	34x3	34x3½	4	4.0x4.3	25.6	L Head	Pairs	Right	Gear	Pump	Springs
Plymouth, G-2	4,000	1,800		126	Solid	36x5	36x6	4	4.8x5.0	36.1	L Head	Pairs	Right	Gear	Pump	Springs
Pope-Hartford	6,000		21	138½	Solid*	36x6	36x4	4			Straight	Pairs	Head	Gear	Pump	Springs
Pope-Hartford	10,000		21	140	Solid*	36x7	42x6	4			Straight	Pairs	Head	Gear	Pump	Springs
Progress, A	3,000	2,900			Solid	36x3½	36x5	4	4.1x5.3	27.3	L Head	Pairs	Left	Gear	Pump	Springs
Progress, B	6,000	5,700			Solid*	36x5	36x4	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Randolph, 1 ton	2,000			115	Solid	36x4	38x5	4	3.8x4.5	22.5	L Head	Pairs	Side		Pump	
Randolph, 2 ton	4,000			125	Solid	36x4	38x5	4	4.1x5.3	27.3	L Head	Pairs	Side		Pump	
Randolph, 4 ton	8,000			136	Solid*	36x6	40x5	4	4.5x5.5	32.4	L Head	Pairs	Side		Pump	
Randolph, 5 ton	10,000			140	Solid*	36x7	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp		Pump	
Randolph, R	12,000			140	Solid*	36x7	40x6	4	5.0x5.8	40.0	T Head	Pairs	Opp		Pump	
Reo, H	1,500	1,700		90	Solid	36x2½	36x3	1	4.8x6.0	9.0	L Head	Sep't	Side	Gear	Thermo	
Reo, J	4,000	4,000		130	Solid*	36x4	36x3	4	4.0x4.5	25.6	L Head	Pairs	R & H	Gear	Pump	
Robinson, B	3,000			112	Solid	34x4	Opt	4	4.3x4.8	36.1						
Robinson, D	4,000	4,200		112	Solid*	34x4	Opt	4	4.3x4.8	36.1						
Rowe, A	1,500			120	Solid	34x4½	34x4½	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, B	2,000			138	Solid	34x4½	34x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, C	3,000			144	Solid	34x4½	34x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, D	4,000			150	Solid*	36x4	36x3½	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, E	6,000			150	Solid*	36x4	36x4	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
Rowe, F	10,000			150	Solid*	36x4	38x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	
S. & S., 1,000	1,500	2,450		136	Solid	34x4½	34x4½	4	4.1x5.3	27.3	L Head	Sep't	Left	Gear	Pump	
Sampson, 3 ton	6,000	6,000		140	Solid*	34x4	36x4	4	4.5x5.5	32.4	L Head	Pairs	Right	Gear	Thermo	Springs
Sampson, 1½ ton	3,000	4,000		110	Solid	32x4	34x5	4	4.0x5.0	25.6	L Head	Pairs	Right	Gear	Thermo	Springs
Sampson, 5 ton	10,000	8,000		155	Solid*	36x6	36x6	4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Thermo	Springs
Sandusky, B	1,500	2,700	35	120	Solid	34x4	34x4½	4	3.8x5.0	22.5	L Head	Block	Right	Hel'l	Pump	Springs
Sandusky, C	3,000	3,369	35	106	Opt	Opt	Opt	4	3.8x5.0	22.5	L Head	Block	Right	Gear	Pump	Springs
Sanford, J	2,000	2,400	32	88	Solid	38x3	38x3	3	4.0x4.5		2 Cycle	Sep't			Air	
Sanford, K	2,000	2,700	34	106	Solid	36x3½	36x3½	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	Springs
Saurer, 5 ton	10,000			153½	Solid*	36x5	42x5	4	4.4x5.5	30.6	T Head	Pairs	Opp		Pump	
Saurer, 6½ ton	13,000			159	Solid*	36x5	42x6	4	4.4x5.5	30.6	T Head	Pairs	Opp		Pump	
Schacht, Delivery	1,800			120		34x4	34x4	4	4.3x5.5	28.9	L Head	Block	Right	Sp'l	Pump	
Schacht, 1 ton	2,000	4,000		138	Solid	40x3½	40x4	4	4.3x5.5	28.9	L Head	Block	Right	Sp'l	Pump	
Schacht, 18	4,000			158	Solid*	36x3½	36x3½	4	4.3x5.5	28.9	L Head	Block	Right	Sp'l	Pump	Springs
Schacht, 19	6,000		48	144	Solid*	36x4	36x4	4	4.3x5.5	28.9	L Head	Block	Right	Sp'l	Pump	Springs
Schacht, 21	8,000		48	144	Solid*	36x5	36x5	4	4.3x5.5	28.9	L Head	Block	Right	Sp'l	Pump	Springs
Schleicher, 3 ton	6,000			Opt	Opt	Opt	Opt	4	5.0x5.5	40.0	L Head	Pairs	Left	Gear	Pump	Rubber
Schleicher, 5 ton	10,000			Opt	Opt	Opt	Opt	4	5.5x6.0	48.4	L Head	Pairs	Left	Gear	Pump	Rubber
Schmidt, F††	1,500			90	Solid			2				Sep't			Air	
Schmidt, C††	2,000			92	Solid			2				Sep't			Air	
Seagrave, C		5,000	40	124	Solid	36x4	38x3½	4	5.8x6.0	53.0	Straight	Sep't	Head	Gear	Air	
Seagrave, D2	4,000	5,500	40	136	Solid	36x4	38x3½	6	5.8x6.0	79.5	Straight	Sep't	Head	Gear	Air	
Seagrave, F	6,000	7,500	30	148	Solid*	36x4	38x3½	4	6.0x8.0	57.6	T Head	Sep't	Opp	Gear	Pump	Springs
Seagrave, G				144	Solid*	36x4	38x3½	6	5.8x6.0	79.5	Straight	Pairs	Head	Gear	Pump	Springs
Seitz	1,500			92	Solid	34x3	34x3	4	3.5x4.5	19.6	L Head	Pairs	Side		Pump	
Seitz, 1 ton	2,000			108	Solid	36x3½	36x3½	4	4.5x4.5	32.4	L Head	Pairs	Side		Pump	
Seitz, 2 ton	4,000			118	Solid*	36x4	36x2½	4	4.5x5.0	32.4	L Head	Pairs	Side		Pump	
Seitz, 3 ton	6,000			124	Solid*	36x5	36x3½	4	5.0x5.0	40.0	L Head	Pairs	Side		Pump	
Seitz, 5 ton	10,000			130	Solid*	36x6	40x4	4	5.5x6.5	48.4	T Head	Pairs	Opp		Pump	
Selden, J	2,000	2,900	25	125	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Selden, J	2,500	2,900	25	145	Solid	36x3½	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	
Service, J	1,500	2,200	32	115	Solid	36x3	36x3	4	3.8x5.5	22.5	L Head	Block	Right	Gear	Pump	Springs
Service, K	2,000	2,300	32	115	Solid	34x3	34x3½	4	3.8x5.5	22.5	L Head	Block	Right	Gear	Pump	Springs
Service, M	3,000	2,900	38	130	Solid	34x3½	34x4	4	4.1x5.3	27.3	L Head	Block	Right	Gear	Pump	Springs
Smith, 3½ ton	7,000							4	5.0x5.8	40.0	T Head	Pairs	Opp	Sp'l	Pump	
Smith, 6 ton	12,000							4	5.3x5.8	44.1	T Head	Pairs	Opp	Sp'l	Pump	

† Three wheels. †† Two-cylinder opposed. \* Drives on four wheels. ††† Gas-electric power plant.  
**ABBREVIATIONS:**—Tires: Solid\*, solid dual tires in rear. Cylinders: Sep't, separate. Valves: Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. Camshaft Drive: Gear, spur gears; Hel'l, helical gears; Sp'l, spiral gears. Cooling: Thermo, thermo-siphon. Radiator Suspension: S & T, springs and trunnions. Ignition: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3=4½ etc., 2=2, 1=1, 3=3, 4=4, 5=5, 6=6, 7=7, 8=8, 9=9.

ABBREVIATIONS: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Pres, splash and pressure; In Fuel, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3=4½ etc., 2=2, 1=1, 3=3, 4=4, 5=5, 6=6, 7=7, 8=8, 9=9.



## Turning Radius and the Chassis Weight for 1913—Continued

IGNITION			Carburetor	Motor Lubrication	TRANSMISSION					RUNNING GEAR					BEARINGS		
System	Magneto or Generator	Control			Clutch Type	GEARSET			Gear Ratio	Final Drive	SPRINGS		CONTROL			Gearset	Rear Axle
						Type	Location	No. Forw'd Speeds			Front	Rear	Steering Wheel	Gear-shift	Emergency Brake		
Dual		Hand	Stromberg	Pressure	Disk	Plan	Unit M	2		Bevel	1/2 Ell	1/2 Ell	Left	Pedal		P & R	Roll
Dual	Remy	Hand	Schebler	Spl-Press	Cone	Sel		3		Bevel	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	B & R
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	B & R	Ball
Dual	Eisemann	Auto	Own	Splash	Disk	Pro	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	B & R	Ball
Dual	Spl'd r.	Hand	Stromberg	Spl-Press	Disk	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	B & R	Ball
Dual	Spl'd r.	Hand	Stromberg	Spl-Press	Disk	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Remy	Hand	Schebler	Splash	Disk	Sel		3		Chain	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	Ball
Dual	Eisemann	Hand	Schebler	Splash	Cone	Sel	Unit M	3	4.0-1	Bevel	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Bosch	Hand	Own	Splash	Cone	Sel	Amid	4	10.5-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Doub	Bosch	Hand	Own	Splash	Cone	Sel	Amid	3		Worm	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	B & R
Dual	Briggs	Hand	Stromberg	Splash	Cone	Sel	Amid	3	4.0-1	Ext G.	1/2 Ell	Plat	Right	Right	Right	Ball	Ball
Dual	Spl'd r.	Hand	Schebler	Splash		Fric	Amid			Chain	1/2 Ell	Plat	Left	Left	Left	Roll	Roll
Dual	Spl'd r.	Hand	Schebler	Splash		Fric	Amid			Chain	1/2 Ell	Plat	Left	Left	Left	Roll	Roll
Dual	Eisemann	Fixed	Own	Spl-Press	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Plain	Roll
Dual	Eisemann	Fixed	Own	Spl-Press	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Plain	Roll
Dual	Optional	Hand	Stromberg	Spl-Press	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right		Ball	Roll
Dual	Optional	Hand	Stromberg	Spl-Press	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right		Ball	Roll
Dual	Bosch	Fixed		Splash	Cone	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right		
Dual	Bosch	Fixed		Splash	Opt	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual	Bosch	Fixed		Splash	Cone	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Ball
Dual	Bosch	Fixed		Splash	Cone	Sel	Unit J	4		Chain	1/2 Ell	1/2 Ell					
Sing.	National	Hand	Holley	Splash	Disk	Plan	Unit M	2	Opt	Chain	1/2 Ell	1/2 Ell	Left	Center	Pedal	Plain	Roll
Dual		Hand	Holley	Splash	Disk	Sel	Amid	3	11.0-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Pedal	Roll	Roll
Dual		Hand		Spl-Press	Disk	I.C	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual		Hand		Spl-Press	Disk	I.C	Amid	3		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Roll
Dual		Hand		Pressure	Disk	Sel	Amid	3		Chain	1/2 Ell	Plat	Right	Right	Right	Plain	Roll
Doub	Eisemann	Fixed	Rayfield	Spl-Press	Cone	Sel	Unit M	3	4.0-1	Bevel	1/2 Ell	1/2 Ell	Right	Center	Center	Ball	B & R
Dual		Hand	Stromberg	Spl-Press	Disk	Sel	Unit J	3		Chain	1/2 Ell	1/2 Ell	Left	Left	Left	Ball	Roll
Dual		Hand	Stromberg	Spl-Press	Disk	Sel	Unit J	3		Chain	1/2 Ell	1/2 Plat	Left	Left	Left	Ball	Roll
Dual	Bosch	Hand	Stromberg	Spl-Press	Cone	Sel	Unit J	4		Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Remy	Hand	Schebler	Splash	Cone	Sel	Unit J	3	5.0-1	Chain	1/2 Ell	1/2 Plat	Left	Center	Center	Ball	Ball
Sing	Gov		Schebler	Splash	Cone	Sel	Unit M	3		Chain	1/2 Ell	1/2 Plat	Left	Left	Left	Ball	Roll
Sing	Bosch	Fixed	Holley	Splash	Disk	Plan	Amid	2	4.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Pedal	Ball	Roll
Doub	Remy	Hand	Schebler	Pressure	Disk	Sel	Unit M	3	4.1-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Ball	Roll
Dual	Eisemann	Hand	Own	Pressure	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell				Ball	Ball
Dual	Eisemann	Hand	Own	Pressure	Cone	Sel	Amid	4		Chain	1/2 Ell	1/2 Ell				Ball	Ball
Dual		Hand	Opt	Spl-Press	Cone	Sel	Amid	3		Bevel	1/2 Ell	1/2 Ell	Opt	Opt	Opt	Ball	B & R
Dual		Hand	Opt	Spl-Press	Cone	Sel	Amid	3		Worm	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Ball
Doub		Hand	Opt	Spl-Press	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Doub		Hand	Opt	Spl-Press	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Doub		Hand	Opt	Spl-Press	Cone	Sel	Amid	3		Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand	Stromberg	Spl-Press	Disk	Sel	Unit J	4	5.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand	Stromberg	Spl-Press	Cone	Sel	Unit J	4	6.0-1	Chain	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	Roll
Sing			Schebler	Spl-Press		Plan		2		Chain	1/2 Ell	Coil	Right	Right			
Sing			Schebler	Spl-Press		Plan		2		Chain	1/2 Ell	Coil	Right	Right			
Doub	Bosch	Hand	Rayfield	Spl-Press	Cone	Sel	Amid	3	4.4-1	Chain	1/2 Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Press	Cone	Sel	Amid	3	4.4-1	Chain	1/2 Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Press	Cone	Sel	Amid	3	4.4-1	Chain	1/2 Ell	Plat	Right	Center	Center	Ball	Roll
Doub	Bosch	Hand	Rayfield	Spl-Press	Cone	Sel	Amid	3	4.4-1	Chain	1/2 Ell	Plat	Right	Center	Center	Ball	Roll
Dual	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	1/2 Ell	1/2 Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	1/2 Ell	1/2 Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	1/2 Ell	1/2 Ell					Roll
Doub	Remy	Hand	Schebler	Pressure		Fric	Amid			Chain	1/2 Ell	1/2 Ell					Roll
Dual	Briggs		Stromberg	Splash	Disk	Sel	Unit M	3	7.7-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Briggs		Stromberg	Splash	Disk	Sel	Unit M	3	7.7-1	Chain	1/2 Ell	1/2 Ell	Left	Center	Center	Roll	Roll
Dual	Briggs	Hand	Stromberg	Spl-Press		Fric	Amid		6.0-1	Chain	1/2 Ell	1/2 Ell	Left	Left	Left	B & R	Ball
Dual	Briggs	Hand	Stromberg	Spl-Press		Fric	Amid		6.0-1	Chain	1/2 Ell	1/2 Ell	Left	Left	Left	B & R	Roll
Dual	Briggs	Hand	Stromberg	Spl-Press		Fric	Amid		7.3-1	Chain	1/2 Ell	1/2 Ell	Left	Left	Left	B & R	Roll
Doub	Eisemann	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Worm	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	B & R
Doub	Eisemann	Hand	Stromberg	Splash	Disk	Sel	Amid	3		Worm	1/2 Ell	1/2 Ell	Right	Right	Right	Roll	B & R

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. Gearset: Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. Gearset Location: Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. Drive: Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. Springs: 1/2 Ell, semi-elliptic; Ell, elliptic; 1/4 Ell, 1/4 elliptic; Plat, platform. Bearings: Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball roller and plain.



## Specifications American Commercial Cars, Including Horsepower,

NAME AND MODEL	Load Capacity Pounds	Chassis Weight Pounds	Turning Radius Feet	Wheel-base	TIRES			No. Cylinders	Bore and Stroke	S. A. E. H. P.	CYLINDERS		Valve Location	Camshaft Drive	COOLING	
					Kind	Front	Rear				Shape	How Cast			Circulation	Radiator Suspension
Speedwell, 2 ton	4,000	4,900	34	115	Solid	36x4	Opt	4	4.1x5.3	27.3	L Head	Block	Left	Gear		
Speedwell, 4 ton	8,000	6,600	35	Opt	Solid*	36x5	36x5	4	5.0x5.0	40.0	L Head	Pairs	Left	Gear		
Speedwell, 6 ton	12,000	7,200	42½	139	Solid*	36x6	36x6	4	5.0x5.0	40.0	L Head	Pairs	Left			
Standard, 3 ton	6,000	6,100		120	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100		148	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100		168	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Standard, 3 ton	6,000	6,100		192	Solid*	36x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Hel'l	Pump	Springs
Stearns, 5 ton	10,000	6,500		144	Solid	34x5	38x5	4	4.8x6.0	36.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Stearns	10,000	6,500		180	Solid	34x5	38x5	4	4.8x6.0	36.1	T Head	Sep'rt	Opp	Gear	Pump	Springs
Stegeman, 1 ton	2,000	3,000		Opt	Solid	34x3	36x4	4	3.8x4.1	22.5	L Head	Block	Left	Gear	Pump	
Stegeman, 2 ton	4,000	4,200		Opt	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	
Stegeman, 3 ton	6,000	5,600		Opt	Solid*	36x4	40x4	4	4.1x5.3	32.4	L Head	Block	Left	Gear	Pump	
Stegeman, 4 ton	8,000	6,000		155	Solid*	36x5	40x5	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	
Stegeman, 6 ton	12,000	7,000		165	Solid*	36x6	40x6	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	
Stegeman, 1,500	1,500	2,400		120	Solid	34x2½	34x3	4	3.8x5.3	22.5	T Head	Block	Opp	Gear	Pump	
Sternberg, 2 ton	4,000	4,000	60	116	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 2 ton	4,000	4,000	60	140	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 2 ton	4,000	4,000	60	160	Solid*	34x4	36x3½	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 3 ton	6,000	6,200	60	130	Solid*	36x4	40x4	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 3 ton	6,000	6,200	60	160	Solid*	36x4	40x4	4	4.3x6.8	28.9	L Head	Pairs	Left	Gear	Pump	
Sternberg, 4 ton	8,000	7,300	56	144	Solid*	36x5	40x5	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Sternberg, 6 ton	12,000	9,000	56	144	Solid*	36x6	42x6	4	5.3x7.0	44.1	T Head	Pairs	Opp	Gear	Pump	Springs
Stewart, 1,500 lbs	1,500	2,500	32	123	Solid	34x4	35x4½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Studebaker, 75T	2,500		25	100	Solid	34x3	34x4	4	3.3x5.0	16.9	T Head	Block	Opp	Sp'l	Thermo	
Studebaker, 77T	8,000		50	144	Solid*	38x5	38x5	4	4.4x6.5	30.6	T Head	Pairs	Opp	Sp'l	Pump	Springs
Sullivan, 20	1,000	1,700	38	93	Solid	36x2½	36x2½	4	4.5x4.5	32.4	L Head	Sep'rt	Head	Gear	Thermo	
Sullivan, 51	1,500	1,900	38	117	Solid	36x2½	36x3	2	4.5x4.5	16.2	L Head	Sep'rt	Head	Gear	Thermo	
Superior, A	2,000	2,500		110				4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Toledo, A	2,000			102	Solid	36x3	36x4	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Toledo, A	2,000			115	Solid	36x3	36x3	4	4.1x5.3	27.3	L Head	Block	Left	Gear	Pump	Springs
Toledo, B	4,000			130	Solid*	36x4	36x3	4	4.5x5.5	32.4	L Head	Block	Left	Gear	Pump	Springs
Transit, F	4,000	4,800		144	Solid*	36x4	36x3½	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Springs
Transit, T	7,000	5,600		144	Solid*	36x5	36x4	4	4.5x5.0	32.4	L Head	Pairs	Right	Gear	Pump	Springs
Transit, V	10,000	6,200		144	Solid*	36x6	40x6	4	4.8x5.5	36.1	T Head	Pairs	Opp	Gear	Pump	Springs
Triumph, 1 ½ ton	3,000				Opt	Opt	Opt	4	4.5x5.3	32.4	L Head	Block	Left	Gear	Pump	
Tulsa, 10	1,500	2,400		116	Solid	36x3	36x3½	4	3.8x4.5	22.5	T Head	Block	Opp	Gear	Thermo	Springs
Tulsa, 1 ton	2,000	2,700		132	Solid	36x3½	36x4	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Tulsa, 1½ tons	3,000	2,800		144	Solid*	36x3½	36x3	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Tulsa, 1½ tons	3,000	2,800		137	Solid*	36x3½	36x3	4	4.1x5.3	27.3	T Head	Block	Opp	Gear	Pump	Springs
Universal Truck††	12,000			132	Solid*	36x5	36x5	4	5.0x6.0	40.0	Straight	Pairs	Right	Gear	Pump	Springs
Universal, C	2,000	3,200	19	130	Solid	34x3½	34x5	4	3.8x5.3	22.5	L Head	Block	Right	Gear	Thermo	
Universal, A	6,000	5,400	18	132	Solid*	36x5	36x4	4	4.0x5.5	25.6	T Head	Pairs	Opp	Gear	Pump	Springs
U. S., E	4,000	4,500		132	Solid*	34x3½	36x3½	4	4.1x5.3	27.3	L Head	Block	Left	Sp'l	Pump	Springs
U. S., D	6,000	6,200		144	Solid*	34x5	36x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Sp'l	Pump	Springs
Velie, Y	5,000	5,500	50	148	Solid*	36x4	36x3½	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
Velie, Z	7,000	6,500	50	148	Solid*	36x5	40x5	4	4.5x5.5	32.4	L Head	Pairs	Left	Gear	Pump	Springs
V. C., B		3,600		130	Solid	36x4	36x4	4	3.8x5.3	22.5	L Head	Block	Left	Gear	Pump	Trunnions
Veearc, B††	2,000	1,850	40	86	Solid			2	4.0x4.0		2 Cycle	Sep'rt			Air	
Victor, 3 ton	6,000			145	Solid*	36x5	36x4	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	Springs
Victor, 5 ton	10,000			156	Solid*	36x5	40x6	4	4.9x5.5	38.0	T Head	Pairs	Opp	Gear	Pump	Springs
Vulcan, 3 ton	6,000			144	Solid*	36x4	36x4	4	4.6x5.5	34.3	L Head	Pairs	Side		Thermo	
Vulcan, 4 ton	8,000			162	Solid*	36x5	36x5	4	4.4x5.5	30.6	L Head	Pairs	Side		Thermo	
Vulcan, 4½ ton	9,000			162	Solid*	36x6	36x5	4	4.4x5.5	30.6	L Head	Pairs	Side		Thermo	
Vulcan, 5 ton	10,000							4	4.4x5.5	30.6	L Head	Pairs	Side		Thermo	
Vulcan, 6 ton	12,000							4	4.8x5.5	36.1	L Head	Pairs	Side		Pump	
Vulcan, 7 ton	14,000			156	Solid*	36x7	42x6	4	4.8x5.5	36.1	L Head	Pairs	Side		Pump	
Wagenhals	800	1,000	30	80	Solid	28x3	32x4	4	3.5x3.4	19.6	L Head	Pairs	Right	Gear	Pump	
Ware, A	4,000	5,000	10	124	Solid	37x5	37x5	4	4.5x6.0	32.4	Straight	Sep'rt	S & H	Gear	Pump	Rubber
Warren, 12-30	1,000			110	Solid	32x4	32x4	4	4.0x4.5	25.6	L Head	Block	Side		Pump	
White Star, B		3,200		132	Solid	34x3½	36x4	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	S & T
White Star, C		3,600		144	Solid	34x4	36x5	4	4.0x4.5	25.6	L Head	Pairs	Left	Gear	Pump	S & T
White Star, D		4,500		156	Solid*	34x4	36x3½	4	4.3x5.5	28.9	T Head	Pairs	Opp	Gear	Pump	S & T
White, G B E	1,500			120	Solid	34x4½	34x4½	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	
White, G T B	3,000			144	Solid*	36x4½	36x4½	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	
White, G T A	6,000			163	Solid*	36x5	40x4	4	3.8x5.1	22.5	L Head	Block	Left	Gear	Pump	Springs
White, TC	10,000			165	Solid*	36x5	40x6	4	4.3x5.8	28.9	L Head	Block	Right	Gear	Pump	Springs
White, TKA	10,000			145	Solid*	36x5	40x6	4	4.3x5.8	28.9	L Head	Block	Right	Gear	Pump	Springs
Wichita, A	2,000			110	Solid	34x3	34x3½	4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	Springs
Wichita, B	4,000			118	Solid*	34x3½	34x3	4	3.3x5.0	16.9	L Head	Block	Left	Gear	Thermo	
Wilcox, I	2,000			117	Solid	36x3	36x3½	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	
Wilcox, K	3,000			117	Solid	36x3½	36x4	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	
Wilcox, J	6,000			126	Solid*	36x4	36x3½	4	4.3x4.5	28.9	L Head	Pairs	Side	Gear	Pump	
Willet	4,000			144	Solid*	36x4	36x3½	4	4.5x5.0		2 Cycle	Block	Right			
Wolverine, C	1,000	1,650	35	96	Pneu.	32x4	32x4	1	4.5x5.5	8.1	L Head	Sep'rt	Right	Gear	Thermo	
Zimmerman, T	800			95	Solid	36x2	36x2	2	4.8x4.0	18.0	L Head	Sep'rt	Side	Gear	Air	

†Three wheels. ††Two-cylinder opposed. \*Drives on four wheels. †††Gas-electric power plant.

**ABBREVIATIONS:**—Tires: Solid\*, solid dual tires in rear. Cylinders: Sep't, separate. Valves: Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. Camshaft Drive: Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. Cooling: Thermo, thermo-syphon. Radiator Suspension: S & T, springs and trunnions. Ignition: Sing, single; Doub, double; Gov, governor; Auto, automatic. Magneto or Generator: Atw K, Atwater Kent. Fuel Feed: Grav, gravity; Pres, pressure. Lubrication: Spl-Pre, splash and pressure; In Fuel, oil fed with gasoline. Bore and Stroke: In decimals to nearest 1-10 inch, as 4.3-4.4; etc., .2- $\frac{7}{16}$ . 1-4, 3-4, 4-5, 5-6, 6-7, 7-8, 8-9, 9-10.

## Turning Radius and the Chassis Weight for 1913—Concluded

IGNITION			Carburetor	Motor Lubrication	TRANSMISSION					RUNNING GEAR					BEARINGS	
System	Magneto or Generator	Control			Clutch Type	GEARSET		Gear Ratio	Final Drive	SPRINGS		CONTROL			Gearset	Rear Axle
						Type	Location			Front	Rear	Steering Wheel	Gearshift	Emergency Brake		
Sing.	Eisemann	Auto.		Splash	Cone	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center		
Sing.	Eisemann	Auto.		Splash	Cone	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center		
Sing.	Eisemann	Auto.		Splash	Cone	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center		
Sing.	Eisemann	Gov.	Zenith	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Roll	Roll
Sing.	Eisemann	Gov.	Zenith	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Roll	Roll
Sing.	Eisemann	Gov.	Zenith	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Roll	Roll
Sing.	Eisemann	Gov.	Zenith	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Roll	Roll
Dual	Bosch	Hand.	Stromberg	Splash	Diak.	Sel.	Amid	4	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand.	Stromberg	Splash	Diak.	Sel.	Amid	4	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Ball	Roll
Sing.	Eisemann	Auto.	Stewart	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Sing.	Eisemann	Auto.	Stewart	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Sing.	Eisemann	Auto.	Stewart	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Sing.	Eisemann	Auto.	Stewart	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Sing.	Eisemann	Auto.	Stewart	Spl-Pres	Diak.	Sel.	Unit M.	3	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Dual	Eisemann	Auto.		Splash	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto.		Splash	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto.		Splash	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto.		Splash	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto.		Splash	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto.		Pressure	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Dual	Eisemann	Auto.		Pressure	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Ball	Roll
Sing.	Bosch	Fixed	Rayfield	Spl-Pres	Diak.	Sel.	Amid	3	3.4-1 Bevel	1/2 Ell.	1/2 Ell.	Left	Center	Center	Roll	Roll
Sing.	Eisemann	Auto.	Own	Exp Bd	Exp Bd	Sel.	Unit M.	3	Int G	1/2 Ell.	1/2 Ell.	Right	Center	Center	Ball	Ball
Sing.	Eisemann	Auto.	Own	Exp Bd	Exp Bd	Sel.	Unit M.	4	Int G	1/2 Ell.	1/2 Ell.	Right	Center	Center	Ball	Ball
Sing.	Bosch	Fixed	Schebler	Spl-Pres	Diak.	Plan.	Unit J.	2	Chain	1/2 Ell.	1/2 Ell.	Left	Pedal	Center	Ball	Ball
Sing.	Bosch	Fixed	Schebler	Spl-Pres	Diak.	Plan.	Unit J.	2	Chain	1/2 Ell.	1/2 Ell.	Left	Pedal	Center	Ball	Ball
Sing.			Rayfield	Spl-Pres	Diak.	Sel.	Unit J.	3	7.8-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Center	Roll	Ball
Dual	Bosch	Hand.	Stromberg	Splash	Diak.	Sel.	Unit M.	3	9.0-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand.	Stromberg	Splash	Diak.	Sel.	Unit M.	3	9.0-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand.	Stromberg	Splash	Diak.	Sel.	Unit M.	3	12.0-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand.	Stromberg	Splash	Diak.	Sel.	Unit J.	3	9.4-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand.	Stromberg	Splash	Diak.	Sel.	Unit J.	3	10.7-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Dual	Briggs	Hand.	Stromberg	Splash	Diak.	Sel.	Unit J.	3	12.1-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Sing.	Bosch	Hand.	Stromberg	Splash	Cone	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Ball
Doub.	Opt.	Hand.	Opt.	Splash	Cone	Sel.	Unit M.	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Plain	Ball
Doub.	Opt.	Hand.	Opt.	Splash	Cone	Sel.	Unit M.	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Plain	Roll
Doub.	Opt.	Hand.	Opt.	Splash	Cone	Sel.	Unit M.	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Plain	Roll
Doub.	Opt.	Hand.	Opt.	Splash	Cone	Sel.	Unit M.	3	Chain	1/2 Ell.	Plat.	Right	Right	Right	Plain	Roll
Doub.	Briggs	Hand.	Schebler	Spl-Pres	Diak.	Sel.	Unit M.	3	Ext G.	1/2 Ell.	1/2 Ell.	Right	Center	Pedal	P & B	B & R
Doub.	Eisemann	Hand.	Holley	Spl-Pres	Diak.	Sel.	Unit M.	3	Worm	1/2 Ell.	1/2 Ell.	Left	Center	Center	Roll	Ball
Dual	Bosch	Hand.	G. & A.	Spl-Pres	Cone	I. C.	Amid	3	8.0-1 Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Ball	Roll
Dual	Bosch	Hand.	G. & A.	Spl-Pres	Cone	I. C.	Amid	3	7.8-1 Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Ball	Roll
Doub.	Bosch	Hand.	Stromberg	Spl-Pres	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Doub.	Bosch	Hand.	Stromberg	Spl-Pres	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Roll	Roll
Dual	Bosch	Hand.	Schebler	Spl-Pres	Cone	Sel.	Amid	3	8.0-1 Chain	1/2 Ell.	1/2 Ell.	Left	Center	Center	Ball	Ball
Doub.	Opt.	Hand.	Kriece	In Fuel	Diak.	Plan.	Amid	2	6.2-1 Chain	1/2 Ell.	1/2 Ell.	Left	Left	Pedal	Ball	Ball
Doub.	Bosch	Hand.	Schebler	Spl-Pres	Cone	Sel.	Unit J.	3	6.3-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Plain	Roll
Doub.	Bosch	Hand.	Schebler	Spl-Pres	Cone	Sel.	Unit J.	3	6.3-1 Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Plain	Roll
Dual	Bosch	Hand.	Own	Spl-Pres	Cone	Sel.	Unit J.	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right		
Dual	Bosch	Hand.	Own	Spl-Pres	Cone	Sel.	Unit J.	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right		
Dual	Bosch	Hand.	Own	Spl-Pres	Cone	Sel.	Unit J.	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right		
Dual	Bosch	Hand.	Own	Spl-Pres	Cone	Sel.	Unit J.	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right		
Dual	Bosch	Hand.	Own	Spl-Pres	Cone	Sel.	Unit J.	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right		
Dual	Bosch	Hand.	Own	Spl-Pres	Cone	Sel.	Unit J.	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right		
Doub.	Briggs	Hand.	Marvel	Spl-Pres	Cone	Plan.	Unit M.	2	9.0-1 Chain	1/2 Ell.	1/2 Ell.	Center	Pedal	Pedal		Roll
Dual	Briggs	Hand.	Kingston	Spl-Pres	Diak.	Sel.	Amid	4	Bevel	1/2 Ell.	Plat.	Right	Pedal		Roll	B & R
Doub.	Bosch	Fixed	McCord	Spl-Pres	Cone	Sel.	Amid	3	Bevel	1/2 Ell.	1/2 Ell.				Plain	B & R
Sing.	Eisemann	Auto.	G. & A.	Spl-Pres	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Plain	Roll
Sing.	Eisemann	Auto.	G. & A.	Spl-Pres	Diak.	Sel.	Amid	3	Bevel	1/2 Ell.	1/2 Ell.	Right	Right	Right	Plain	Roll
Sing.	Eisemann	Auto.	G. & A.	Spl-Pres	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Plain	Roll
Sing.	Mea	Hand.	Own	Spl-Pres	Cone	Sel.	Amid	4	Bevel	1/2 Ell.	1/2 Ell.	Right	Right	Right	Ball	Ball
Sing.	Mea	Hand.	Own	Spl-Pres	Cone	Sel.	Amid	4	Bevel	1/2 Ell.	1/2 Ell.	Right	Right	Right	Ball	Ball
Sing.	Mea	Hand.	Own	Spl-Pres	Cone	Sel.	Amid	4	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Right	Ball	Ball
Sing.	Mea	Hand.	Own	Spl-Pres	Cone	Sel.	Amid	4	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Sing.	Mea	Hand.	Own	Spl-Pres	Cone	Sel.	Amid	4	Chain	1/2 Ell.	1/2 Ell.	Left	Center	Left	Ball	Ball
Opp.	Opp.	Hand.	Stromberg	Spl-Pres	Cone	Sel.	Unit J.	3	7.3-1 Chain	1/2 Ell.	1/2 Ell.	Right	Center	Center	B & R	Ball
Opp.	Opp.	Hand.	Stromberg	Spl-Pres	Cone	Sel.	Unit J.	3	8.3-1 Chain	1/2 Ell.	1/2 Ell.	Right	Center	Center	B & R	Ball
Dual	Bosch	Hand.	Bennett	Spl-Pres	Cone	Sel.	Amid	3	Chain	1/2 Ell.	Plat.				Roll	Roll
Dual	Bosch	Hand.	Bennett	Spl-Pres	Cone	Sel.	Amid	3	Chain	1/2 Ell.	Plat.				Roll	Roll
Dual	Bosch	Hand.	Bennett	Spl-Pres	Cone	Sel.	Amid	3	Chain	1/2 Ell.	Plat.				Roll	Roll
Dual	Eisemann	Auto.	Zenith	In Fuel	Diak.	Sel.	Amid	3	Chain	1/2 Ell.	1/2 Ell.	Left	Pedal	Center	Roll	Roll
Sing.	Battery	Hand.	Holley	Spl-Pres	Fric	Sel.	Amid	3	Bevel	1/2 Ell.	1/2 Ell.	Left	Left	Pedal	Roll	Roll
Sing.	Battery	Hand.	Schebler	Spl-Pres	Diak.	Plan.	Amid	2	Chain	1/2 Ell.	1/2 Ell.	Right	Right	Pedal	Plain	Ball

ABBREVIATIONS:—Clutch: Exp B, expanding band; Con B, contracting band. Gearset: Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; I. C., individual clutches. Gearset Location: Amid, amidships; Unit M, unit with the motor; Unit J, unit with the jackshaft; Unit X, unit with the rear axle. Drive: Bevel, shaft with bevel gears at rear axle; Worm, shaft with worm gears at rear axle; Ext G, external gear; Int G, internal gear. Springs: 1/2 Ell, semi-elliptic; Ell, elliptic; 1/4 Ell, 1/4 elliptic; Plat, platform. Bearings: Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball roller and plain.





# Vehicle Buyers' Guide

is the highest with a price mark of \$3,500. There are forty-nine manufacturers represented in this class and a total of seventy-by twenty-seven manufacturers in the 1 to 2-ton class.

While there are not as many chassis offered in this class as in the 1 to 2-ton class, nevertheless the fact that a number of the makers are offering any body style makes the selection quite an extensive one. The Lewis model 21 is an example of specific body choice. While seven body styles are offered, and these to be placed on the same chassis, four are for some particular line of business. However, besides the brewery, furniture, coal and dump trucks mentioned, this company will undoubtedly furnish other body styles. The chassis price is \$3,250, an additional sum being added for the body.

## The Heavy Types

It must be borne in mind that in all cases where optional body is noted and no price given, that this price will vary according to the body type. For example, a special type of padded van is required for use in the piano business, and in a case of this kind the manufacturer is forced to ask more than the chassis price alone. As in the cases of trucks of smaller capacity the difference in price between two

trucks of the same carrying capacity is due largely to chassis design material and workmanship.

Trucks in the 3 to 4-ton class are those whose capacities do not fall below 6,000 nor above 7,999 pounds. It will be noted that the body dimensions of these cars are slightly greater than those of the cars in the preceding capacity classifications. This may be attributed to the longer wheelbase, which with the latter comes usually an increase in body dimensions. The average price of the ninety-nine chassis listed in this class is \$3,320. The combined efforts of fifty-seven manufacturers are necessary for the production of these ninety-nine chassis and on the whole the maker lists his chassis with optional body and body dimensions. The Progress model B has bodies specially designed for use by those in the bottling business, a rarity in the matter of stock bodies. This chassis is listed at \$3,500 and has a maximum capacity of 6,000 pounds.

Trucks whose capacities range from 8,000 to 9,999 pounds are manufactured by but eighteen factories. The field for trucks of this size is not as great as that of the vehicles of less capacity, hence the few makers. There is not one instance of a manufacturer in this, the 4 to 5-ton class,

offering more than one chassis. The average price of the chassis is \$3,870. The average wheelbase is 150 inches, which is 18 inches greater than that of the average truck of the 2 to 3-ton class.

Of the twenty-five chassis offered in this class fourteen may be had with optional bodies. It will be noted that in this and in other classes too, a number of new names appear, while others are not listed. In 1912 it was thought advisable to build trucks of large carrying capacity, but some of the makers did not find a ready sale for their products and evacuated the class and have become identified with the lower capacity classifications.

## Truck of Large Capacity

There are more manufacturers represented in the 5-ton class than in the preceding division—thirty-five to be precise. This class includes commercial vehicles whose capacities are 10,000 pounds. The average price of the 5-ton chassis is \$5,140, and this price is the average of the fifty-eight chassis listed in this class. There is no difference in the wheelbase between the average car of this class and that of the 4 to 5-ton aggregation; both being 150 inches.

The demand for trucks of over 5 tons capacity is so small that only thirteen manufacturers are making commercial cars of this tonnage. It will be seen by scanning the 5-ton class of the buyers' guide that the Vulcan is the only vehicle made in more than one chassis style. The Hewitt model is listed as a vehicle of 20,000 pounds capacity, and this is undoubtedly the largest truck manufactured. Of the thirteen makers, twelve offer optional bodies.

The public service vehicles include the taxicab, hearse, ambulance, fire trucks, etc., and since these vary with the conditions of service and on the other hand since most of them are made to order vehicles, dimensions and prices are omitted in a number of cases.

The Seagrave trucks are special fire cars and in the buyers' guide their capacities are given in feet of hose. It will be noticed that the engine of the Seagrave model is the largest engine manufactured for a vehicle, it developing 79.5 S. A. E. horsepower. It should be remembered that a bus body will in most instances be placed on the ordinary chassis, even though only a few such bodies are mentioned in the buyers' guide.

The dimensions and prices of the vehicles in the public service class are not all stated in the buyers' guide and this is to be expected when it is known that very few of the patrols, etc., are stock.

## Tonnage Classification Buyers' Guide

4 to 5 Tons Vehicles whose capacities are between 8,000 and 9,999 pounds inclusive	5 Tons Vehicles of 10,000 pounds capacity	Over 5 Tons Vehicles over 10,000 pounds capacity	Public Service All vehicles in use by the public in general
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A number of stake bodies may be furnished and the dimensions of these are different for every line of business. Since the body dimensions vary, the price is omitted in some instances. However, there are examples of the manufacturer neglecting to give this data in due time.

### TRUCKS UNDER 1-TON CAPACITY—Continued

NAME AND MODEL	CAPACITY POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Brookway, A.....	1,000		Express.....	\$950	3' 8"		6' 2"	9' 6"
Brookway, A.....	1,000		Panel.....	1,100	3' 8"	5'	5' 6"	9'
Brooks, A'.....	800	\$600		625	3'		5' 6"	10'
Brooks, B.....	800	600		650	3'	4' 6"	5'	10'
Brooks, C.....	800	600		675	3'	4' 6"	5'	10'
Brown.....	1,500	1,600	Open Express.....		3' 8"	2' 8"	7' 6"	14' 7"
Brown.....	1,500	1,600	Panel.....		3' 8"	2' 8"	7' 6"	14' 7"
Brown.....	1,500	1,600	Stake.....		3' 8"	3' 8"	7' 6"	14' 7"
Brown.....	1,500	1,600	Screen.....		3' 8"	2' 8"	7' 6"	14' 7"
Bucklen, A.....	1,500	1,400	Open Express.....	1,450	3' 9"		9' 2"	9' 3"
Bucklen, A.....	1,500	1,400	Stake.....	1,490	3' 9"		10'	10'
Bucklen, A.....	1,500	1,400	Delivery.....	1,490	3' 9"		7' 6"	7' 9"
Cameron.....	800		Express.....	725	3'	4' 7"	4' 8"	12'
Cameron.....	800		Van.....	775	3' 5 1/2"	4' 7"	6' 3"	12'
Chase, M.....	500	500	Express.....	500	4' 4"		4' 10"	10' 5"
Chase, M.....	500	500	Panel.....	600	4' 4"	2' 9"	4' 10"	10' 5"
Chase, D.....	1,000	855	Express.....	900	3' 6"		5' 6"	12' 6"
Chase, D.....	1,000	855	Stake.....	950	Opt.		Opt.	12' 6"
Chase, D.....	1,000	855	Panel.....	1,050	3' 8"	5'		12' 6"
Cino, 440-D.....	1,500	1,300		1,600	3' 10"	4' 10"	5'	12' 8"



## Differences in Motors

### One Cannot Draw Comparisons Between Truck and Pleasure Car Engines

IT has been said that the pleasure car motor would not do for truck work and vice versa, the differences in the work done requiring different constructions. A pleasure car motor is carrying a lighter machine at higher speeds, works on pneumatic tires and is generally handled carefully either by owner or chauffeur. A motor truck carries a heavy load at medium speeds over less favorable roads and on hard tires. The pleasure car motor operates at the whim of its owner, and for perhaps an hour or so a day average. At the same time it must be able to do touring work by the day without trouble.

#### Differences in Operation

The motor truck motor operates 8 to 24 hours in the day, is taken care of in its small rest period if tended to at all, and works 6 days a week on a steady grind. There are no interims during which a driver can tighten parts or tend to details. These must be right in the first place and not come loose if the truck is to make good. Not operating intermittently like the pleasure vehicle the motor truck works on schedule. Not all trucks run this way but every truck sent out from a factory must be capable of doing it in the 2-foot snow of Minnesota in winter, or at 100 in the shade in summer.

Thus on the surface the conditions are widely different. The motor must be as different as the conditions.

A closer look takes into account the gear ratio. Though the pleasure car motor runs the vehicle faster the rate of revolutions at maximum speed is no higher. Though the truck motor hauls a bigger load the leverage on the rear wheels is greater, due to decreased speed and gearing down.

#### Service Comparisons

The service idea looks more formidable as a comparison, where one motor is running intermittently and the other constantly. Here there is a real difference, but it is one of wear. The touring car motor is used less and in common service at city speeds runs at a slower speed so that the wear on parts is considerably less than in a truck motor which will turn over twice as fast to get the same city speed, and keep it up all day. The truck motor then, if but a touring car motor ordinarily built, may lack the wearing qualities which are needed in truck work. A motor that would last 4 years in a touring car might not last 1 on a truck.

There are touring car motors, however, designed for heavy work, and these fitted to motor trucks have made good. The different requirements over the lighter type, however, to gain greater lasting qualities would be larger wearing surfaces, such as bearings, cam faces, valve guides, and seat area, connecting rod sizes, and piston and ring areas, etc.

## TRUCKS UNDER 1-TON CAPACITY—Continued

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Croxtan, 10.....			Delivery.....	\$2,000	Opt..	Opt..	Opt..	Opt..
Crawford, 13-30.....	1,200	\$1,300	Delivery.....	1,450	3' 8"	5' 2"	6'	13'
Crawford, 13-30.....	1,200	1,300	Delivery.....	1,400	3' 8"	5' 2"	6'	13'
Crown, A.....	1,500	1,250		1,350	3' 8"	4' 2"	6'	13' 6"
Dart.....		950	Optional.....		Opt..	Opt..	Opt..	Opt..
Day-Utility, D.....			Combination.....	1,500	Opt..	Opt..	Opt..	Opt..
Detroit, 111.....	1,000	900	Open Express.....	950	3' 8"		5' 6"	12'
Detroit, 111.....	1,000	900	Stake.....	950	3' 9"		5' 6"	12'
Detroit, 111.....	1,000	900	Panel.....	975	3' 8"		5' 6"	12'
Detroit, 111.....	1,000	900	Panel.....	985	3' 8"		5' 6"	12'
Dispatch, L.....	1,000	800	Panel.....	900	3'	4' 9"	7'	14' 6"
Dispatch, L.....	1,000	800	Delivery.....	850	3'		7'	14' 6"
Dispatch, L.....	1,000	800	Furniture.....	850	3'		7'	14' 6"
Dispatch, L.....	1,000	800	Laundry.....	900	3'		7'	14' 6"
Dispatch, N.....	1,000	800	Grocer.....	850	3'		6'	14' 6"
Dorris, H.....	1,500	2,100	Optional.....		Opt..	Opt..	Opt..	Opt..
Ford, T.....	1,000	750	Optional.....		Opt..	Opt..	Opt..	Opt..
Gabriel, G.....		900	Optional.....					
Geneva, B.....	1,200	1,250	Open Express.....	1,300	3' 9"		5' 3"	12'
Geneva, C.....	1,000	1,250	Panel.....	1,350	3' 9"	4' 8"	4' 10"	12'
Gleason, 10.....	1,000		Open Express.....	1,050	3' 6"		6'	14'
Gleason, 10.....	1,000		Canopy.....	1,100	3' 6"	6'	6'	14'
Gleason, 10.....	1,000		Panel.....	1,150	3' 6"	6'	6'	14'
Handy Wagon.....	500	390	Optional.....		2' 7"		2' 8"	8' 6"
Handy Wagon.....	800	487	Optional.....		2' 3"		3' 10"	8' 6"
Hart-Kraft, B.....	1,000		Optional.....	825				
Hart-Kraft, BX.....	1,500		Optional.....	900				
Hart-Kraft, G.....	1,500	1,800	Express.....	1,950				
Hart-Kraft, G.....	1,500	1,800	Panel.....	250				
Hatfield, J.....	1,000	850	Express.....	950	3' 8"		6' 6"	10' 6"
Hatfield, J.....	1,000	850	Stake.....	950	4'		7' 6"	11' 6"
Hatfield, K.....			Optional.....		Opt..	Opt..	Opt..	Opt..
Hupmobile, HT.....	800	850	Panel.....	950	3' 4"	4' 10"	4' 4"	6'
Ideal, I.....	1,500	1,500	Optional.....		Opt..	Opt..	Opt..	Opt..
I. H. C., A.....	1,000		Open Express.....		3' 6"	10'	6' 4"	
I. H. C., M.....			Optional.....		Opt..	Opt..	Opt..	Opt..
Kearns, A.....	1,000	850	Laundry.....	1,150	Opt..	Opt..	Opt..	Opt..
Kearns, A.....	1,225	850	Optional.....		4' 7"		5'	
Kearns, A.....	1,075	850	Optional.....	1,150	Opt..	Opt..	Opt..	Opt..
Kisselcar.....	1,500	1,500	Stake.....	1,625	3' 8"		6' 9"	
Kisselcar.....	1,500	1,500	Express.....	1,625	3' 8"		6' 9"	
Klinekar, 2-16.....	1,250	1,250	Optional.....		Opt..	Opt..	Opt..	Opt..
Koehler.....	1,600	725	Open Express.....	750	3' 8"	4' 8"	7'	12'
Koehler.....	1,600	725	Canvas Top.....	790	3' 8"	4' 8"	7'	12'
Koehler, A.....	1,600	725	Closed.....	800	3' 8"	4' 8"	6' 6"	12'
Koehler.....	1,600	725	Panel.....	900	3' 8"	4' 8"	7'	12'
Koehler, B.....	1,000	725	Panel.....	825	3' 8"	4' 8"	7'	12'
Koehler.....	1,600	725	Stake.....	775	3' 8"	4' 8"	7'	12'
Krebs, A.....	1,500	1,375	Express.....	1,510	3' 9"		8'	8' 6"
Krebs, A.....	1,500	1,375	Screen.....	1,550	3' 9"	4' 6"	8'	8' 6"
Krebs, A.....	1,500	1,375	Stake.....	1,510	3' 9"		8'	8' 6"
Lambert.....	1,500	1,125	Panel.....	1,300	3' 8"		6'	
Lambert.....	1,500	1,125	Stake.....	1,200	3' 8"		6'	
Lambert.....	1,500	1,125	Express.....	1,200	3' 8"		6'	
Lincoln, 27.....	800	625	Panel.....	785				
Lincoln, 29.....	800	625	Open Express.....	685				
Lippard-Stewart, B.....	1,500	1,650	Panel.....		3' 9"	4' 10"	7'	15'
Lippard-Stewart, B.....	1,500	1,650	Stake.....		4' 10"		7'	16'
Lippard-Stewart, B.....	1,500	1,650	Express.....		3' 9"	4' 10"	7'	15' 13"
Luck Utility.....	1,000		Delivery.....					
Marmon.....	1,500	2,500	Optional.....		Opt..	Opt..	Opt..	Opt..
Mason, 12.....	1,000		Delivery.....	800	3' 6"	4'	3' 7"	12'
Mason, 12.....	1,200		Open Delivery.....	800	3' 6"		5' 5"	12'
Mason, 10.....	1,600		Delivery.....	1,000	3' 6"		7' 2"	13'
Menominee, A.....	1,500	1,125	Express.....	1,200	3' 6"		6' 6"	13' 6"
Menominee, A.....	1,500	1,125	Stake.....	1,200	5'		7'	14' 6"
Menominee, A.....	1,500	1,125	Panel.....	1,300	3' 6"		6' 6"	13' 6"
Mercury, P.....	1,000		Panel.....	875	3' 3"	5'	7' 2"	9'
Mercury, P.....	1,000		Open Express.....	750	3' 3"		7' 2"	9'
Mercury, P.....	1,000		Panel.....	900	3' 3"	5'	7' 2"	9'
Modern, B.....	1,000	1,200	Optional.....		3' 8"	1'	6'	14'
Modern, BX.....	1,000	1,350	Optional.....					
Modern, BR.....	1,000	1,225	Optional.....		3' 8"	1'	8'	14'
Modern, A.....	1,500		Open Express.....	1,750	3' 9"	1'	7' 6"	15' 8"
Modern, AX.....	1,500		Open, Express.....	1,750	3' 9"	1'	10'	15' 8"
Moore, 1-ton.....	1,500							
Mora, 20.....	1,500	950	Open Express.....	1,000	3' 9"		6' 8"	12' 9"
Mora, 20.....	1,500	950	Open Express.....	1,064	3' 9"		8'	14' 2"
Mora, 20.....	1,500	950	Open Express.....	1,178	5' 9"	5'	8'	14' 2"
Mora, 20.....	1,500	950	Grocery.....	1,200	3' 9"	5'	6' 8"	12' 9"

## TRUCKS UNDER 1-TON CAPACITY—Concluded

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
McIntyre, E.	1,500	\$1,500	Optional		5'		8' 3"	15' 4"
Moore, C.	1,500	1,350	Optional		3' 8"		6' 8"	13' 1"
Motorette, L1	400		Delivery	\$400	2' 7"	1' 11"	3' 3"	9' 4"
Motorette, N1	500		Delivery	500	2' 7"	2' 3"	4'	9'
Oliver, A.	1,500	1,250	Express	1,350	3' 8"		6'	12'
Oliver, A.	1,500	1,250	Screen	1,400	3' 8"	4' 6"	6'	12'
Oliver, A.	1,500	1,250	Panel	1,450	3' 8"	4' 6"	6'	12'
Oliver, A.	1,500	1,250	Brewery	1,400	4' 1"	4' 6"	6'	12'
Oliver, B.	1,500		Optional	2,200	Opt.	Opt.	Opt.	Opt.
Reo, H.	1,500	700	Express	750	4'		6'	11'
Reo, H.	1,500	700	Stake	750	4'		7'	12'
Rowe, A.	1,500							
Sandusky, B.	1,500	1,650	Express	1,750	3' 10"	1' 3"	7' 6"	
Sandusky, B.	1,500	1,650	Panel	1,800	3' 10"	5' 6"	6' 6"	
Sandusky, B.	1,500	1,650	Stake	1,750	3' 10"		7' 6"	
Schacht, MB4	1,800		Delivery					
Schmidt	1,000	975	Open Express		Opt.	Opt.	Opt.	Opt.
Schmidt	1,500	1,025	Optional		Opt.	Opt.	Opt.	Opt.
Seitz	1,500	1,500	Optional		Opt.	Opt.	Opt.	Opt.
Service, J.	1,500		Open Express		4'		8'	15' 6"
Service, J.	1,500		Panel		3' 6"	4' 6"	8'	15' 6"
Service, J.	1,500		Stake		5' 6"		8'	15' 6"
Stegeman	1,500	1,600	Panel		4'		8'	13'
Stewart	1,500	1,650	Panel	1,800	3' 9"	5'	7'	14' 6"
Stewart	1,500	1,650	Express	1,775	3' 9"	5'	7'	14' 6"
Stewart	1,500	1,650	Stake	1,775	5'		7'	14' 6"
Stewart	1,500	1,650	Open Express	1,775	3' 9"		7'	14' 6"
Sullivan, 20	1,000	925	Optional	1,050	3' 2"	4' 9"	5' 1"	8' 6"
Sullivan, 51	1,500	950	Furniture	1,125	3' 10"		9'	
Sullivan, 51	1,500	950	Coal	1,125	3' 10"		7' 6"	
Sullivan, 51	1,500	950	Plumber	1,075	3' 10"		7' 6"	
Sullivan, 51	1,500	950	Stake	1,000	4'		7' 6"	
Tulsa, 10	1,500	1,500	Express	1,650	Opt.	11"	8'	15'
Wagenhals	800		Open Express	600	3' 4"	2' 6"	5' 10"	12' 6"
Wagenhals	800		Closed Express	600	3' 4"	2' 6"	5' 10"	12' 6"
Warren, 12-30	1,000		Express	1,325				
White, GBE	1,500	2,100	Express	2,250	3' 7"	5'	6' 10"	14' 10"
White, GBE	1,500	2,100	Platform	2,250	5'	2'	6' 10"	14' 10"
Wolverine, C	1,000	800	Express	850	3' 6"	1'	6'	11' 3"
Wolverine, C	1,000	800	Panel	900	3' 6"	3' 6"	6'	11' 3"
Wolverine, C	1,000	800	Stake	875	4'		6'	11' 3"
Zimmerman, T	800	450	Open Express	700	3'	2' 6"	5' 6"	8' 6"

## TRUCKS OF 1 TO 2 TONS CAPACITY

Adams, A.	3,000		Optional	\$2,100	3' 10"		8' 10"	
Anglaize, D.	2,000	\$1,850	Optional	1,900				
Armleder, B.	2,000	2,200	Express	2,300	4' 4"		8'	18'
Armleder, B.	2,000	2,200	Express	2,350	4' 4"	6'	8'	18'
Armleder, B.	2,000	2,200	Screen	2,400	4' 4"	6'	8'	18'
Armleder, B.	2,000	2,200	Panel	2,450	4' 4"	6'	7'	18'
Armleder, B.	2,000	2,200	Stake	2,300	4' 4"	6'	8'	18'
Atterbury, B.	2,000		Optional		4'	5' 6"	8'	16'
Available, 24	2,000	1,250	Express	1,350	3' 8"	1' 2"	7' 6"	11' 6"
Available, 24	2,000	1,250	Stake	1,350	3' 8"	1' 2"	7' 6"	11' 6"
Available, 24	2,000	1,250	Grocery	1,400	3' 8"	4' 6"	7' 6"	11' 6"
Available, 24	2,000	1,250	Panel	1,500	3' 8"	4' 6"	7' 6"	11' 6"
Autocar, 21	3,000	2,150	Optional		Opt.	Opt.	Opt.	Opt.
Beck	2,000		Platform	1,250	4' 6"	4'	9' 6"	16'
Bergdoll, C-30	2,600		Express-Delivery	1,600				
Bessemer, B.	2,000	1,800	Express	1,900	5'	5'	8' 6"	14' 6"
Bessemer, B.	2,000	1,800	Stake	1,880	5'		9'	15'
Bessemer, B.	2,000	1,800	Panel	2,000	3' 9"	4'	8'	14'
Bessemer, C	3,000	1,800	Express	2,250	4'	4'	10'	15' 6"
Bessemer, C	3,000	1,800	Stake	2,175	5'		10' 6"	15' 6"
Bessemer, C	3,000	1,800	Panel	2,300	3' 9"	3' 5"	9' 6"	15' 6"
Best	Opt.		Optional		Opt.	Opt.	Opt.	Opt.
Blair, C	3,000	3,000	Express	3,150	4' 6"	1'	10'	15' 8"
Brockway, B.	2,000		Express	1,250	3' 8"	1' 2"	4' 6"	10' 6"
Brockway, B.	2,000		Panel	1,450	3' 4"	5'	6' 6"	10'
Brockway, C	2,500	2,500	Express	1,400	3' 8"	1' 2"	7' 6"	10' 6"
Brockway, C	2,500		Panel	1,600	3' 4"	4' 10"	6' 6"	10' 2"
Bucklen, B.	3,000	1,700	Open Express	1,795	3' 9"		9'	17' 6"
Bucklen, B.	3,000	1,700	Stake	1,825	5' 5"		10'	17' 6"
Cameron	2,000	1,300	Express	1,400	3' 7"	1' 4"	8' 2"	
Cameron	2,000	1,300	Stake	1,400	4'	1' 3"	8' 6"	13'

## Easier to Push Than Pull

## Therefore, Front-Drive and Tractor Ideas Are Receiving Attention

A SIMPLE front-wheel drive would enable motor trucks to accomplish alley feats which go far toward making the motor vehicle a success in city work. Rear wheel drive is not all that might be desired for a number of reasons, and it is not surprising that the tractor, front-drive and four-wheel drive ideas are gaining fast. It is easier to draw a load than to push it, and by drawing there is less liability to skidding, more power for heavy pulls, a better chance perhaps for equal tire load distribution—especially if all four wheels work—and the better ability to run through deep sand, over mud and muck, etc., with a full load where a rear wheel drive machine cannot follow.

## Tests Show Their Worth

This was well shown in the army tests around Sparta, Wis., during the past year. Of eleven makes of trucks entered only one was able to finish the trip at all with full load, and this machine driving from four wheels completed the journey without once removing the load. Two machines owned by the government finally came in with light loads.

In applying the front-wheel drive principle and obtaining a vehicle which could swing about in its own length for yard work the Third Avenue Railway Co., of New York, has built an interesting dump cart with a single drive wheel or tractor wheel in front, electrically-driven. This wheel turns about on a shaft at the top of a fork, much like bicycle construction, the driver steering through a gear sector and pinion. This car is operated at a less cost than an ordinary electric four-wheeler, can turn about in its own length at the dumping place, has speed enough for the yard work and cost to build only about 30 per cent more than a horse and cart. The rear wheels are steel-tired.

The Walter Motor Truck Co., of New York, too, is offering a two-wheel tractor truck to fit the front of a common horse van or truck and made under license of the French Latil firm.

## The Tractor Idea

The idea of front-wheel drive, four-wheel drive and separate tractors, such as the Martin, is an excellent one and bound to win favor from year to year as mechanisms become perfected and the devices are developed, but the newer ideas must be put on the market rationally and without upsetting the existing order of things to much at the start to make good.

The four-wheel drive discussion would not be complete without mention of the well known Couple-Gear devices allowing of driving from front or rear, or both, and of attachment to existing vehicles in a satisfactory way.



## New Idea in Contract Work

### Gasoline Truck Used to Haul Electrics Through Country— Saving Power

AN enterprising western operator of motor trucks engaged in contract delivery is planning to put into effect a trailer idea which will enable him to use electric vehicles for house-to-house delivery at distant points without being hampered by their smaller mileage capacity. In brief, the scheme consists in towing the electrics to the starting point by gas truck, dropping them off on the way at the center of the delivery territory which they are intended to serve, with batteries still fresh and capable of the mileage desired and necessary for their day's work for their owner.

#### Outline of Scheme

The gasoline vehicle of large tonnage will be able to draw a couple of the smaller electrics, beside carrying its own load. After the electrics are left behind the larger machine can proceed to a more distant territory and there take up delivery work on its own account, or can start a trip of bulk or furniture delivery covering the same territory in which the electrics operate. Since the stops are farther apart in bulk or furniture work than in the package work the larger machine will be able to cover the same territory in its class of hauling with fewer stops and still meet the electrics at the proper points after they have finished with the package work, and tow them back to the city for reloading.

The idea contains much of merit and what drawbacks there would seem to be at first glance may not be sufficiently harmful to hinder the success of the system. A great deal would depend, of course, on the traffic conditions through which the machines would work in being towed out of the city, for a trailer, or trailers, running through crowded streets is a considerable source of danger, especially to pedestrians who are so apt to dodge between vehicles without stopping to notice whether they are connected or not. Provision would need to be made for guarding against accidents of this kind.

#### Possibilities of Future

Eventually it may be possible to develop electric vehicles for this class of work, which during a run to the suburbs can be supplied with current from the main truck and run on the streets more or less independently so far as traffic is concerned. In other cases it might be better to carry the loaded electric vehicle bodies on the platform of the big truck, unloading them onto electric chassis at the different branch points.

Whatever method is eventually adopted for this work the present idea is the nucleus around which may develop other ideas and methods growing eventually into a standard system of delivery and doing away with outlying substations.

## TRUCKS OF 1 TO 2 TONS CAPACITY—Continued

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Cameron .....	2,000	\$1,300	Express.....	\$1,400	3' 7"	1' 3"	8' 2"	13'
Cass .....	2,500	1,850	Optional .....	2,000	Opt ..	Opt ..	Opt ..	Opt ..
Chase, H.....	2,000	1,200	Express.....	1,250	3' 9"		6' 6"	13' 3"
Chase, H.....	2,000	1,200	Stake.....	1,300	3' 9"		6' 4"	13' 3"
Chase, H.....	2,000	1,200	Panel.....	1,450	3' 9"	4' 10"	6' 4"	13' 3"
Chase, K.....	2,000	1,350	Express.....	1,400	3' 9"		6' 6"	13' 3"
Chase, K.....	2,000	1,350	Stake.....	1,450	3' 9"		6' 4"	13' 3"
Chase, K.....	2,000	1,350	Panel.....	1,600	3' 9"	4' 10"	6' 4"	13' 3"
Chase, L.....	3,000	1,675	Express.....	1,750	4'		7' 6"	14'
Chase, L.....	3,000	1,675	Stake.....	1,825	4'		7' 6"	14'
Chase, L.....	3,000	1,675	Panel.....	1,950	Opt ..	Opt ..	Opt ..	14'
Clark, C.....	Opt ..	2,000	Optional .....					14'
Clark, D.....		2,000						14'
Clark, E.....	Opt ..	2,150						16'
Coleman.....	2,000	1,800	Open Express ..	1,900	3' 8"		8' 4"	14' 2"
Coleman.....	2,000	1,800	Express.....	2,000	3' 8"		8' 4"	14' 2"
Coleman.....	2,000	1,800	Stake.....	1,900	3' 10"		10'	14' 10"
Continental, AE ..	3,000	1,850	Optional .....	1,950	4'	6'	11'	15'
Continental, AE ..	2,000	1,850	Optional .....	2,000	4'	1'	12'	10'
Crescent .....	2,000		Optional .....					
Crown, B.....	2,000	1,450		1,550	3' 8"	1' 2"	7'	14' 6"
Crown, C.....	3,000	2,000		2,125	Opt ..	1' 2"	Opt ..	16' 6"
Dart .....	3,000	1,800	Box.....		4'		8' 4"	
Decatur, B.....	3,000	2,500	Standard.....		Opt ..	Opt ..	Opt ..	Opt ..
Diamond, T-J.....	3,000	2,250	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Eclipse, B-2.....	2,000	1,900	Stake.....	2,000	Opt ..	Opt ..	Opt ..	Opt ..
Eclipse, B-2.....	2,000	1,900	Express.....	2,000	Opt ..	Opt ..	Opt ..	Opt ..
Eclipse, B-2.....	2,000	1,900	Express.....	2,030	Opt ..	Opt ..	Opt ..	Opt ..
Eclipse, B-2.....	2,000	1,900	Panel.....	2,100	Opt ..	Opt ..	Opt ..	Opt ..
Eclipse, B-2.....	2,000	1,900	Stake.....	2,000	Opt ..	Opt ..	Opt ..	Opt ..
Erving.....	3,000		Optional .....					
Federal, C.....	2,000	1,800	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Federal, D.....	2,000	1,800	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Four-Wheel Drive, G.....	3,000	3,600	Stake.....	3,750	5'	3'	11'	11' 4"
Gabriel, H.....		1,350	Optional .....					
Gabriel, J.....		2,200	Optional .....					
G. M. C., VC.....	2,500		Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Gramm, 1.....	2,000	1,750	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Hart-Kraft, E.....	2,000							
Hart-Kraft, C.....	3,000							
Hercules, E.....	2,000		Express.....	1,775	4' 6"	1'	9' 6"	15'
Hercules, E.....			Stake.....					
Ideal, H.....	2,000	1,750	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Ideal, H-2.....	2,000	2,000	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Ideal, G.....	3,000	2,250	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Indiana, H.....	3,000	2,000	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Johnson, A.....	2,000		Express.....	2,000				
Johnson, A.....	2,000		Stake.....	2,000				
Kisselkar.....	2,000	2,000	Optional .....	2,125	3' 8"		8'	
Kelly, K-30.....	3,000	2,100	Optional .....	2,250	4' 5"		9'	
Kopp, H.....	3,000		Platform.....	2,500				
Lambert.....	2,000	1,700	Stake.....	1,800				
Lambert.....	2,000	1,700	Express.....	1,800				
Lange, C.....	2,000	2,250	Optional .....		3' 8"	Opt ..	7' 6"	13' 6"
Lange, D.....	3,000	2,600	Optional .....		4' 2"	Opt ..	8' 6"	14' 6"
Lauth-Juergens, K.....	2,000	2,100	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Little Giant, D.....	2,000	1,050	Open Express ..	1,100	3' 8"	1' 1"	7' 6"	12' 7"
Little Giant, D.....	2,000	1,050	Optional .....	1,150	3' 8"	4' 10"	7' 6"	12' 7"
Little Giant, D.....	2,000	1,050	Optional .....	1,200	3' 4"	4' 10"	6' 6"	11' 11"
Lord Baltimore, C.....	2,000	2,100	Stake.....		Opt ..		9' 6"	17' 6"
Mack, 1 ton.....	2,000	2,500	Optional .....		Opt ..	Opt ..	9' 6"	17' 6"
Mack, 1½ ton.....	3,000	2,750	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Mais.....	3,000	2,750	Optional .....					
McIntyre, A.....	3,000	2,300	Express.....	2,450	5'		Opt ..	Opt ..
Menominee, B.....	2,000	1,400	Express.....	1,500	3' 8"		8' 6"	15' 7"
Menominee, B.....	2,000	1,400	Stake.....	1,500	5'		8' 6"	15' 7"
Monitor, D.....	2,000	1,700	Express.....	1,750	4'		8'	11'
Monitor, C.....	2,000	1,600	Stake.....	1,650	4'		8'	11'
Monitor, E.....	3,000	1,850	Express.....	1,950	4'		9'	13'
Moreland, B.....	2,000		Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Natco, 15.....		1,925	Optional .....				9' 6"	Opt ..
Nelson LeMoon, D-1 .....	2,000	2,000	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Nyberg.....	3,000							

## TRUCKS OF 1 TO 2 TONS CAPACITY - Concluded

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Piggins .....	2,000	\$1,750	Optional .....	\$1,875	3' 10"	3'	9' 8"	14'
Plymouth, D-2 .....	2,000	1,750	Van .....		4'	5' 6"	8'	13'
Progress, A .....	3,000		Brewery .....	2,900	5'	3'	10'	14' 7"
Progress, A .....	3,000		Express .....	2,850	5'	1'	10'	14' 7"
Progress, A .....	3,000		Platform .....	2,800	5'	4'	10'	14' 7"
Randolph, 1 ton .....	2,000		Optional .....	1,750	Opt ..	Opt ..	Opt ..	Opt ..
Robinson, B .....	3,000		Express .....		4' 6"		10'	
Rowe, B .....	2,000		Optional .....			2' 11"		10'
Rowe, C .....	3,000		Optional .....			2' 11"		10'
Schmidt, C .....	2,000	1,375	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Sampson .....	3,000	2,500	Platform .....	2,600	5'	2' 7"	9'	14'
Sampson .....	3,000	2,500	Delivery .....	2,650	5'	5' 17"	9'	14'
Sampson .....	3,000	2,500	Open Express .....	2,600	5'	1' 10"	9'	14'
Sampson .....	3,000	2,500	Panel .....	2,850	4'	5' 10"	8'	13'
Sandusky, C .....	3,000	2,500	Express .....	2,625		1' 3"	9' 6"	
Sandusky, C .....	3,000	2,500	Stake .....	2,600			9' 6"	
Sanford, J .....	2,000	1,400	Optional .....	1,500	3' 9"	1' 4"	Opt ..	Opt ..
Sanford, K .....	2,000	1,660	Optional .....	1,750	3' 9"	1' 4"	Opt ..	Opt ..
Schacht, 16 .....	2,000		Delivery .....		4'	5' 8"	9'	17' 2"
Selden, J .....	2,000	2,000	Furniture .....		5' 6"		10'	
Selden, J .....	2,000	2,000	Stake .....		5' 6"		10'	
Selden, J .....	2,000	2,000	Box .....		3' 10"		9'	
Service, K .....	2,000		Express .....		4'	4' 6"	8'	15' 6"
Service, K .....	2,000		Panel .....		3' 6"	4' 6"	8'	15' 6"
Service, K .....	2,000		Stake .....		5' 6"	9'	16' 6"	
Service, M .....	3,000		Express .....		5' 5"	5'	9'	17'
Service, M .....	3,000		Stake .....		5' 6"		9'	17'
Service, M .....	3,000		Panel .....		3' 6"	4' 8"	8'	16'
Service, M .....	3,000		Express .....		5' 5"		9'	17'
Stegeman .....	2,000	2,250	Optional .....				Opt ..	
Studebaker, 75T .....	2,500		Optional .....					
Superior, A .....	2,000	1,700	Express .....		3' 10"		8' 8 1/2"	
Toledo A .....	2,000	1,700	Optional .....	1,850	4'	3' 2"	Opt ..	
Triumph .....	3,000	1,800	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Tulsa, 1 ton .....	2,000	2,000	Stake .....	2,150	Opt ..	4'	9' 10"	17' 10"
Tulsa, 1 1/2 ton .....	3,000	2,200	Stake .....	2,350	Opt ..	4' 9"	9' 10"	17' 10"
Universal, C .....	2,000	1,950	Optional .....		5'	Opt ..	10'	17'
V. C., B .....	3,000	2,350						
Veerac, B .....	2,000	1,100	Open Express ..	1,150	3' 6"	9' 6"	7' 4"	11' 4"
Veerac, B .....	2,000	1,100	Stake .....	1,175	3' 11"		7' 4"	11' 4"
Veerac, B .....	2,000	1,100	Express .....	1,250	3' 6"	4' 4"	7' 4"	11' 4"
White, GTB .....	3,000	3,000	Express .....	3,150	4' 4"	4' 7"	9' 2"	17' 3"
White, GTB .....	3,000	3,000	Platform .....	3,150	5' 4"	1' 11"	9 1/2'	17' 5"
White, Star, C .....	3,000	2,250	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
White, Star, B .....	3,000	1,750	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Wichita, A .....	2,000	1,650	Stake .....	1,760		4 1/2"	8'	
Wichita, A .....	2,000	1,650	Express .....	1,780	3' 9"		8'	
Wichita, A .....	2,000	1,650	Express .....	1,750	3' 9"		8'	
Wichita, A .....	2,000	1,650	Panel .....	1,800	3' 7"	4' 8"	6' 10"	
Wilcox, I .....	2,000	2,300	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Wilcox, K .....	3,000	2,500	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..

## TRUCKS OF 2 TO 3 TONS CAPACITY

Adams, D .....	4,000		Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Alco .....	4,000	\$2,950	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Armleder, D .....	4,000	2,400	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Atterbury, C .....	4,000		Optional .....		4' 6"	5' 6"	10'	18'
Avery, A .....	4,000	2,700						
Blair, D .....	5,000	3,250	Stake .....	\$3,400	5' 2"	2' 6"	Opt ..	Opt ..
Beck .....	4,000		Truck .....	1,500	4' 6"	5'	10'	16'
Cass .....	5,000	2,650	Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Chase, J .....	4,000	2,100	Express .....	2,200	4'		9' 10"	15' 3"
Chase, J .....	4,000	2,100	Stake .....	2,300	4' 4"		9' 11"	15' 3"
Chase, J .....	4,000	2,100	Panel .....	2,500	4'	6'	9' 8"	15' 3"
Colman .....	4,000	2,300	Stake .....	2,400	Opt ..	Opt ..	Opt ..	Opt ..
Colman .....	4,000	2,300	Express .....	2,500	Opt ..	Opt ..	Opt ..	Opt ..
Colman .....	4,000	2,300	Open Express ..	2,400	Opt ..	Opt ..	Opt ..	Opt ..
Crescent .....	4,000		Optional .....		Opt ..	Opt ..	Opt ..	Opt ..
Dayton, H .....	4,000	2,650	Stake .....	2,800	4' 5 1/2"	3'	10' 8"	15' 10"
Dayton, H .....	4,000	2,650	Express .....	2,800	4' 3"	1' 10"	10' 9 1/2"	15' 10"
Elk, C .....	4,000	2,600	Stake .....		4' 6"	Opt ..	Opt ..	Opt ..

## Breakdowns Are Counted

## Horse-Drawn Vehicles in Trouble in Chicago Oftener Than Motor Trucks

THE old expression "get a horse" is fast losing ground and even the public is acknowledging that the motor is the more reliable proposition of the two. One of the first arguments heard in the old days of set opinions as to motor vehicle limitations when a merchant was approached on the motor truck proposition was that of reliability. "We can't take the risk of having the thing break down. We have to get our goods there on time and that's all." These are the very men who now are adopting motor trucks in the largest numbers and who are most enthusiastic in talking about them.

## Noting the Breakdowns

The writer has been making a note during the last 3 months of breakdowns seen on the streets and has not been surprised to count twice the number of failures with horse equipments than were with motor trucks. Six breakdowns were seen with horse outfits and three with motor trucks. One of these latter necessitated but the cleaning of a spark plug, another was caused by chain breakage on a small, fast, hard-tired vehicle of very ancient make and design, and the third on a modern 5-tonner was caused by the breakage of a steering spindle. This last was the only real breakage in the lot.

Of the horse failures, three were due to slipping on pavements, one during the snow period and the others on rainy days. These might be classed in the same category for horse vehicles as the spark and chain incidents with the motor trucks as in all these cases the vehicles were on their way in a few minutes.

Another horse vehicle failure was due to king-pin breakage and a spilling of the entire load, which had to be transferred to another vehicle. Two very similar accidents were caused by axle breakage. The delay caused by another incident where a wagon load was spilled through poor loading and body design, blocking the street for 30 minutes and holding up twenty-seven cars was not listed, as the fault was partly with the loading and not with the vehicle.

## Slippery Pavements No Handicap

On slippery days there was a marked advantage noticed in the way the motor trucks got over the pavements with no trouble and the difficulty experienced by all heavy horse loads. This was true especially in coal hauling. This skidding tendency was more noticeable on misty days and on asphalt pavements, than on rainy or icy days, the small amount of water deposited on the pavements by the mist or fog seeming to mix with the dust on the road into a sort of grease, very slippery and not spread out of the way by the weight of the vehicle tires.



## Driver an Important Item Much Depends on Man Who Is Piloting the Motor Truck or Delivery Rig

A GREAT deal of the success or failure of a motor truck in any delivery service is due to the driver. On his carefulness and mechanical sense depends the life and dependability of the vehicle and on his knowledge of delivery conditions depends the business in which the machine is operating. He must thus be proficient both mechanically and as a delivery man, and it is not to his disadvantage if he be a gentleman in instinct as well, as effecting his relation to customers on the route. Courtesy, and a well controlled temper have graduated many a delivery man to a better job.

Some of the best delivery men fail as mechanical geniuses when put in charge of a truck, but the modern machine is getting so fool-proof that even these are hardly able to do serious damage so they do not run into things.

### Example of Thoughtless Driver

A few days ago a motor truck was seen being towed down a city street dragging on a tire. The rear axle on one side was stuck tight for some reason or other—presumably a jammed differential—and the driver had called for help. A second and big truck was sent out to draw in the small pneumatic-tired machine, and hitching to it with a length of rope drew it at considerable speed over the pavement, the driver of the towed vehicle enjoying the whistle of the rubbing tire on the pavement which could be heard for blocks.

Another driver of a 1-ton machine was seen a day or so later to stop his machine from full speed by jamming on the brakes, sliding the rear wheels on a dry cobblestone pavement and bring the car up within a few feet, almost throwing the helper over the dash. There was no necessity for such a quick stop.

### Careless Ones Disobey Rules

On a package delivery trip the driver of an expensive electric truck of 1,500-pound capacity was seen several times lighting a pipe amongst piles of packing excelsior in the rear of the machine. The rules, he explained when the incident was mentioned, were against smoking, but they all smoked just the same. Even the boy helper smoked cigarets between stops with no objection, and yet before getting back to the barn the driver was careful to warn the writer against telling the boss. These men were all drivers of small vehicles at small wages comparatively. As long as they use present tactics they will hardly graduate, if they even hold their present jobs.

The motor truck driver averages up much better than the teamster, however, in the matter of alertness and care. As a rule he is quicker with deliveries, realizes the greater importance of hurry with the motor vehicle and quickly develops into a higher type of employee.

## TRUCKS OF 2 TO 3 TONS CAPACITY—Continued

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
G. M. C., SC.....	4,000		Optional.....		Opt.	Opt.	Opt.	Opt.
Gramm, 2.....	4,000	\$2,600	Optional.....		Opt.	Opt.	Opt.	Opt.
Gramm, Burnstein.....	4,000							
Hart-Kraft, H.....	4,000		Optional.....		Opt.	Opt.	Opt.	Opt.
Hart-Kraft, D.....	5,000		Optional.....		Opt.	Opt.	Opt.	Opt.
Indiana.....	4,000	2,500						
Jarvis-Huntington.....	4,000	2,750	Panel.....	\$3,200	Opt.		10'	
Jarvis-Huntington.....	4,000	2,750	Delivery.....	3,050	Opt.		10'	
Jarvis-Huntington.....	4,000	2,750	Delivery.....	2,900	Opt.		10'	
Jarvis-Huntington.....	4,000	2,750	Furniture.....	3,000	Opt.		10'	
Jarvis-Huntington.....	4,000	2,750	Standard.....	3,050				
Jarvis-Huntington.....	4,000	2,750	Stake.....	2,900	Opt.		10'	
Johnson, B.....	4,000	2,000	Express.....					
Johnson, B.....	4,000	2,000	Stake.....					
Kisselkar.....	4,000	2,750	Optional.....	2,900	5'		10'	
Knox, R-3.....	4,000	3,000	Wagon.....	3,275	5'		11'	15' 9"
Knox, R-3.....	4,000	3,000	Platform.....	3,325	5'		11'	15' 9"
Knox, R-3.....	4,000	3,000	Van.....	3,450	5'	6' 6"	11'	15' 9"
Knox, R-3.....	4,000	3,000	Panel.....	3,450	5'	6' 6"	11'	15' 9"
Lambert.....	4,000	2,100	Stake.....	2,200	3' 6"			
Lambert.....	4,000	2,100	Express.....	2,200	3' 6"			
Lange, B.....	4,000	3,000	Optional.....		4' 6"	Opt.	10'	16' 6"
Lauth-Juergens, L.....	4,000	2,800	Optional.....		Opt.	Opt.	Opt.	Opt.
Lewis, 21.....	5,000	3,250	Express.....	3,500	5'	1' 6"	11'	19' 6"
Lewis, 21.....	5,000	3,250	Platform.....	3,400	5'	1' 6"	11'	19' 6"
Lewis, 21.....	5,000	3,250	Brewery.....	3,500	5'	1' 6"	11'	19' 6"
Lewis, 21.....	5,000	3,250	Dump.....	3,500	4' 6"	1' 10"	10'	19' 6"
Lewis, 21.....	5,000	3,250	Dump.....	3,600	6'	1' 6"	9'	19' 6"
Lewis, 21.....	5,000	3,250	Furniture.....	3,600	5'	5'	11'	19' 6"
Lewis, 21.....	5,000	3,250	Lumber.....	3,400	6'		11'	19' 6"
Lord Baltimore.....	4,000	2,500	Stake.....		6'		10'	18'
Mack, 2-ton.....	4,000	3,000	Optional.....		Opt.	Opt.	Opt.	Opt.
Mais.....	4,000	2,950	Optional.....		Opt.	Opt.	Opt.	Opt.
Mogul, G.....	4,000	2,800	Optional.....		Opt.	Opt.	Opt.	18' 4"
Moore, 2-ton.....	4,000							
Moreland, E.....	4,000	4,000						
Nelson LeMoon, D.....	4,000	2,500	Optional.....		Opt.	Opt.	Opt.	Opt.
Packard.....	4,000	2,800	Optional.....		Opt.	Opt.	Opt.	Opt.
Plymouth, G-2.....	4,000	2,600	Express.....		4' 6"	5' 8"	10'	15'
Randolph, N.....	4,000	2,250	Express.....					
Reo, J.....	4,000	1,800	Optional.....		5' 2"	9' 7"	1'	6' 6"
Robinson, D.....	4,000	2,500	Optional.....		Opt.	Opt.	Opt.	Opt.
Rowe, D.....	4,000		Optional.....			3' 9"		12'
Schacht, 18.....	4,000		Panel.....		4' 8"		10'	16' 10"
Speedwell, Y.....	4,000	2,850	Optional.....	2,950	Opt.	Opt.	Opt.	Opt.
Stegeman.....	4,000	2,950	Optional.....		Opt.	Opt.	Opt.	10' 8"
Sternberg.....	4,000	2,850	Optional.....		5'	Opt.	Opt.	Opt.
Toledo, B.....	4,000	2,400	Optional.....	2,600	4' 2"	3' 6"	Opt.	
Transit, F.....	4,000	2,850	Optional.....	3,000	5'		14'	20'
U. S., E.....	4,000	2,800	Optional.....		5'	Opt.	10'	16' 6"
Velie, Y.....	5,000		Stake.....		5' 6"		10'	19'
Ware, A.....	4,000	3,500		3,700	5' 5"	3' 6"	9'	17'
White Star, D.....	4,000	2,750	Optional.....		Opt.	Opt.	Opt.	Opt.
Wichita, B.....	4,000	2,100	Stake.....	2,250	5' 6"		10'	
Wichita, B.....	4,000	2,100	Express.....	2,275	3' 9"		9'	
Wichita, B.....	4,000	2,100	Open Express.....	2,225	3' 9"		9'	
Wichita, B.....	4,000	2,100	Panel.....	2,300	3' 9"		8'	
Willet.....	4,000	2,850			5'		12'	

## TRUCKS OF 3 TO 4 TONS CAPACITY

A. & R.....	6,000	\$3,500	Express.....		Opt.	Opt.	Opt.	Opt.
A. & R.....	6,000	3,500	Brewery.....		Opt.	Opt.	Opt.	Opt.
A. & R.....	6,000	3,500	Coal.....		Opt.	Opt.	Opt.	Opt.
A. & R.....	6,000	3,500	Furniture.....		Opt.	Opt.	Opt.	Opt.
Alco, 3½ ton.....	7,000	3,650	Optional.....		Opt.	Opt.	Opt.	Opt.
Atterbury, D.....	6,000		Optional.....		6'	6'	12'	19'
Avery, A.....	6,000		Farm Truck.....		4' 4"		10' 4"	
Avery, B.....	6,000		Standard.....		6' 4"		12'	12' 6"
Barker, B.....	6,000	3,100	Stake.....	\$3,200	6'		14'	14'
Barker, B.....	6,000	3,100	Express.....	3,200	6'		14'	14'

## TRUCKS OF 3 TO 4 TONS CAPACITY - Continued

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Barker, B	6,000	\$3,100	Van	\$3,500	6'		14'	14'
Beck	6,000			1,800	4' 6"	5'	10' 6"	18'
Blair, E	7,000	3,750	Stake	3,900	5' 6"	2' 6"	Opt	Opt
Bucklen, C	6,000	2,400	Stake	2,575	5' 5"		16'	22'
Bucklen, C	6,000	2,400	Open Express	2,525	3' 9"		15'	21' 6"
Couple Gear, HC	7,000	4,850	Stake	5,000	5' 6"	6'	14'	18' 6"
Crescent	6,000		Optional		Opt	Opt	Opt	Opt
Dayton, K	6,000	3,400	Stake	3,600	5' 7"	3' 3"	12' 1"	17' 7"
Dayton, K	6,000	3,400	Express	3,600	5' 4"	2'	12' 1"	17' 7"
Diamond T, G	6,000	3,400	Optional		Opt	Opt	Opt	Opt
Eclipse, D	6,000	3,000	Stake	3,200	Opt	Opt	Opt	Opt
Eclipse, D	6,000	3,000	Express	3,200	Opt	Opt	Opt	Opt
Elk, B	6,000	3,400	Optional		Opt		Opt	Opt
Elk, B	6,000	3,400	Dump					14' 8"
Four-Wheel Drive, B	6,000	4,000	Stake	4,150	5'	4'	11'	11' 4"
G. M. C., H	7,000		Optional		4' 5"	Opt	Opt	Opt
G. M. C., HL	7,000		Optional		4' 5"	Opt	Opt	Opt
G. M. C., HM	7,000		Optional		4' 5"	Opt	Opt	Opt
Gramm, 3	6,000	3,500	Optional		Opt	Opt	Opt	Opt
Gramm, Bernstein	7,000		Optional		Opt	Opt	Opt	Opt
Indiana	6,000	3,200	Express		4' 4"		12'	
Indiana	6,000	3,200	Stake		6'		12'	
Jarvis, 3 1/2 ton	7,000	3,500	Delivery	3,875	Opt	Opt	12'	
Jarvis, 3 1/2 ton	7,000	3,500	Open Express	3,675	Opt		12'	
Jarvis, 3 1/2 ton	7,000	3,500	Furniture	3,800	Opt		12'	
Jarvis, 3 1/2 ton	7,000	3,500	Oil Tank	4,000	Opt		12'	
Jarvis, 3 1/2 ton	7,000	3,500	Stake	3,700	Opt		12'	
Kadix, C	6,000	3,500	Optional		6' 6"		12'	19' 3"
Kadix, C	6,000	3,500	Optional		6' 6"		14'	19' 3"
Kadix, C	6,000	3,500	Optional		6' 6"		15'	19' 3"
Kadix, C	6,000	3,500	Optional		6' 6"		17'	19' 3"
Kato, H	6,000		Stake	3,500	6'		12'	15' 6"
King, 3	7,000	3,350	Optional		6'		13'	17' 6"
Kisselkar, 3 ton	6,000	3,350	Optional	3,500	6'		12' 4"	
Kelly, K-40	7,000	3,500	Optional	3,650	4' 10"		12' 4"	12' 4"
Knickerbocker, 12-3	6,000	3,500	Optional		Opt	Opt	Opt	Opt
Knox, R-15	6,000	3,700	Platform	4,050	6'		12'	
Knox, R-15	6,000	3,700	Express	4,050	6'		12'	
Kopp, L	6,000		Optional		Opt	Opt	Opt	Opt
Lauth-Juergens, M	6,000	3,450	Optional		Opt	Opt	Opt	Opt
Lord Baltimore, A	6,000	3,250	Stake		6'		13'	17' 4"
Mack, 3 ton	6,000	4,000	Optional		Opt	Opt	Opt	Opt
Mais	6,000	3,400	Optional		Opt	Opt	Opt	Opt
Mc Intyre G	6,000	3,200	Platform		6'		12'	19'
Mc Intyre G	6,000	3,200	Stake		6'		15'	21'
Moore, 3-ton	6,000							
Moreland, 13-F	6,000		Optional		Opt	Opt	Opt	Opt
Nelson LeMoon, D-3	6,000	3,000	Optional		Opt	Opt	Opt	Opt
Old Reliable, 2	6,000	2,750	Optional		Opt	Opt	Opt	17'
Packard	6,000	3,400	Optional		Opt	Opt	Opt	Opt
Peerless, TC	6,000	3,700	Optional		6'	Opt	12'	19' 6"
Peerless, TC	6,000	3,700	Optional		6'	Opt	14'	21' 6"
Pope-Hartford	6,000	3,350	Optional	3,550	6' 6"		14'	18' 1 1/2"
Pope-Hartford	6,000		Optional	3,675	6' 6"		16'	20' 1 1/2"
Pope-Hartford	6,000	3,350	Cab Top	3,600				
Progress, B	6,000	3,500	Brewery	3,700	6'	3' 6"	12'	16' 11 1/2"
Progress, B	6,000	3,500	Trunk	3,600	6'		12'	16' 11 1/2"
Progress, B	6,000	3,500	Package	3,700	6'	3' 6"	12'	16' 11 1/2"
Progress, B	6,000	3,500	Bottle	3,800	5' 9"		14' 3"	17' 11 1/2"
Rowe, E	6,000		Optional			4'		12'
Sampson	6,000	3,400	Platform	3,550	5' 6"	3' 3"	12'	17'
Sampson	6,000	3,400	Open Express	3,600	5' 6"	1' 10"	12'	17'
Sampson	6,000	3,400	Delivery	3,650	5' 6"	7'	12'	17'
Seagrave, F	6,000				4' 2"		8'	20'
Schacht	6,000		Barrels		5' 6"		11' 6"	18' 8"
Schacht	6,000		Furniture		5' 8"	6' 10"	12' 6"	19' 8"
Schacht	6,000		Ice		5'	3' 8"	12'	19' 2"
Schacht	6,000		Coal Dump		5' 6"		10'	18' 2"
Schleicher	6,000	4,000	Optional		Opt	Opt	Opt	Opt
Smith, 3 1/2 Ton	7,000	3,750	Optional					
Standard	6,000	2,750	Optional		Opt	Opt	10' 3"	17' 4"
Standard	6,000	2,750	Optional		Opt	Opt	12' 3"	19' 4"
Standard	6,000	2,750	Optional		Opt	Opt	15' 3"	22' 4"
Standard	6,000	2,750	Optional		Opt	Opt	20' 3"	27' 4"

## Loop Service Abandoned

### Chicago Department Stores Call in Motor Buses Because of Conditions

THE motor bus has again been supplanted by the old-fashioned horse bus for downtown Chicago. The motor buses after running for a year and over have been taken off the depot routes from the downtown department stores and put into storage—sixteen of them all told. This does not mean that the motor bus in itself has been a failure in the Windy City.

The fault has been laid by some to the conflicting and questionable motor car laws of Chicago which forbid a motor vehicle passing a standing street car under any conditions, and the law is enforced. This means that the motor truck must trail a slow street car for blocks without a chance to pass as the speed necessary to pass the car between blocks downtown is prohibitive. This law has hindered the operation of the vehicles but is not the real reason for the withdrawal of the motors.

#### Why the Scheme Failed

The machines have been operated under contract with the downtown department stores, some of which were stockholders in the bus company operating the vehicles. When the lines were put in for one company the others—owners of stock—had to have their service. If one line had served all, it might have been possible to make a showing, but to satisfy the separate stores two separate lines had to be operated, duplicating routes and competing with each other. The result was that most of the buses ran but half full. One line could have had full buses most of the time. As a result of lack of sufficient load to make the system pay the contract was not renewed. The vehicles were then withdrawn and put in storage.

The Parmelee company of Chicago prefers the front door type of motor bus to the rear platform vehicle necessitating a conductor. This allows the driver to see everyone entering and guard against personal injury suits without witnesses, to collect fares handily, and to tend the door. Left-hand drive is necessary of course with this front door system.

#### To Make Longer Runs

The buses are to be put to work again in the near future on longer runs north and south, carrying passengers on long hauls instead of merely through the most crowded portion of the city, as in the past, where most of the running is on second gear. This will enable the machines to make a better showing, have a chance for greater trade, to run on the good roads and in short to have a good chance of returning a dividend.

It is stated on good authority that another firm is about to put sixteen new motor buses on Chicago streets, operating from an enormous central garage. Some of the plan sounds exceptionally feasible.



## Developing Little Rigs

### Cheaper Motor Delivery Vehicle Seems to be Demanded by Small Concerns

MORE than passing mention is due to the stage of construction and development of motor delivery wagons of under 1-ton capacity. There is more real cry for a cheaper vehicle to fill this field than in any other. Makers are trying to furnish a vehicle which will do the work which will be cheap enough to build to make it a real manufacturing proposition.

#### Troubles of the Business Men

The corner groceryman if he spends over \$400 has to have time to pay. He cannot get a vehicle today which sells as low as this which will do his work, and if he could the upkeep of garage expense, etc., looks like a nightmare to him. The downtown grocer can afford from \$750 up and he can get plenty of vehicles.

The cheaper the vehicle the more small firms can afford to buy it, and yet merely making a motor wagon small does not necessarily mean that it is cheaper to build. The construction of a cheap vehicle must be such as to be made by cheap operations rather than by expensive ones and not by slighting the workmanship on machining operations. If first cost of a vehicle is important the upkeep expense is more so and cheap workmanship will never win for a truck on this account.

The construction must be such that the grocery boy can operate the machine after a day's practice and can keep it in repair as easily as Mike does his motor cycle.

#### Simplicity the Keynote

All of this means that the machine for the very cheapest classes must come to the basic simplicity of things. It must not slight ability to accomplish things, such as hill work under load or speed, but the means taken to accomplish these ends must be of the simplest, the fewest parts and the cheapest to manufacture. It is in this class of car that one may look to see the friction drive become most common, as it allows of many speeds and a reverse, is cheap to make and long lived where power is low and the design correct, is almost foolproof and easy to keep up. The final drive to the rear may be by belts to get rid of the cost of differential—there is no reason why this cannot be done successfully for light work—or by some motor cycle type of chain-drive. Whether the tread will be standard on the machine for city work remains to be seen.

The present cheapest machines are many of them first-class products, but there is a great call for even cheaper vehicles.

The maker who develops a fast, small delivery vehicle of this class for a low price, if the quality be there, will reap a big reward, it is believed.

## TRUCKS OF 3 TO 4 TONS CAPACITY—Continued

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Stegeman.....	6,000	\$3,500	Optional.....		Opt..	Opt..	Opt..	Opt..
Sternberg.....	6,000	3,400	Optional.....		5' 6"		12'	
Sternberg.....	6,000	3,400	Optional.....		5' 6"		15'	
Transit, T.....	7,000	3,500	Express.....	\$3,700	5' 6"		14'	20'
Transit, T.....	7,000	3,500	Stake.....	3,650	5' 6"		14'	20'
Transit, T.....	7,000	3,500	Combination.....	3,700	5' 6"		14'	20'
Transit, T.....	7,000	3,500	Rear Dump.....	4,000	5' 4"		12'	18'
Universal, A.....	6,000		Platform.....	3,525	6'		12' 4"	17'
U. S., D.....	6,000	3,500	Optional.....		6'		12'	19' 6"
Velie, Z.....	7,000	3,350	Stake.....	3,500	6' 6"		14'	21'
Velie, Z.....	7,000	3,350	Optional.....		Opt..	Opt..	Opt..	Opt..
Victor, 3-ton.....	6,000	2,750	Optional.....					
Vulcan.....	6,000	3,600	Optional.....		Opt..	Opt..	Opt..	Opt..
White, GTA.....	6,000	3,700	Platform.....	3,850	6' 6"	2' 5"	3' 3"	20' 7½"
Wilcox, J.....	6,000	3,250	Optional.....		Opt..	Opt..	Opt..	Opt..

## TRUCKS OF 4 TO 5 TONS CAPACITY

A & R., 4-ton.....	8,000	\$3,700	Optional.....		Opt..	Opt..	Opt..	Opt..
Johnson, C.....	8,000	3,200	Optional.....		Opt..	Opt..	Opt..	Opt..
KaDix, D.....	8,000	4,000	Optional.....		Opt..	Opt..	Opt..	Opt..
Kisselkar.....	8,000	3,650	Stake.....	\$3,800	6'		13'	
Kisselkar.....	8,000	3,650	Express.....	3,800	6'		13'	
Longest, 3A.....	8,000	4,000	Optional.....		Opt..	Opt..	Opt..	Opt..
Lord Baltimore, E.....	8,000	3,750	Stake.....		6'		14'	18' 4"
Mack, 4-ton.....	8,000	4,250	Optional.....		Opt..	Opt..	Opt..	Opt..
Mogul, O.....		3,800	Optional.....					18' 2"
Moore, 4-ton.....	8,000							
Packers, E.....	8,000		Express.....		6'		12'	19' 2"
Packers, E.....	8,000		Express.....		5' 6"	5' 6"	12'	19' 2"
Peerless, TC.....	8,000	4,000	Optional.....		6'	Opt..	Opt..	Opt..
Randolph, A.....	8,000		Optional.....	3,600		2' 11"	13'	
Schacht, 21.....	8,000		Brewery.....		5' 6"		11' 6"	18' 8"
Schacht, 21.....	8,000		Furniture.....		5' 8"	6' 10"	12' 6"	19' 8"
Schacht, 21.....	8,000		Ice.....		5' 8"	3' 8"	12'	19' 2"
Schacht, 21.....	8,000		Stake.....		6' 6"	4' 10"	12'	19' 2"
Schacht, 21.....	8,000		Coal.....		5' 6"		10'	18' 2"
Speedwell, Z.....	8,000	3,750	Optional.....	3,850	Opt..	Opt..	Opt..	Opt..
Stegeman.....	8,000		Optional.....		Opt..	Opt..	Opt..	Opt..
Sternberg.....	8,000	4,000	Optional.....		6'		15'	
Studebaker, 77T.....	8,000		Optional.....		Opt..	Opt..	Opt..	Opt..
Vulcan.....	9,000	4,500	Optional.....		Opt..	Opt..	Opt..	Opt..
Vulcan.....	8,000	4,000	Optional.....		Opt..	Opt..	Opt..	Opt..

## TRUCKS OF 5 TONS CAPACITY

A. & R.....	10,000	\$4,350	Optional.....					
A. I. C., B.....	10,000	3,500	Ice.....	\$3,750	6'	4'	12'	17'
Alco.....	10,000	4,750	Optional.....					
Atterbury, E.....	10,000				6'	6'	12'	19'
Avery, B.....	10,000		Standard.....		6' 4"		14'	14' 8"
Barker, B.....	10,000	3,100	Express.....	3,700	6'		14'	14'
Barker, B.....	10,000	3,100	Stake.....	3,700	6'		14'	14'
Barker, B.....	10,000	3,100	Van.....	4,000	6'		14'	14'
Couple Gear, AC.....	10,000	5,400	Stake.....	5,600	6'	6'	14'	18' 6"
Diamond T, G.....	10,000	3,600	Optional.....		Opt..	Opt..	Opt..	Opt..
Dayton, M.....	10,000	4,500	Stake.....	4,700	5' 9½"	3' 3"	13' 1"	18' 7"
Dayton, M.....	10,000	4,500	Express.....	4,700	5' 7"	2' 1"	13' 3"	18' 7"
Elk, E.....	10,000	4,100	Standard.....				14' 2"	18' 8"
Elk, E.....	10,000	4,100	Short.....				12' 7"	17' 1"
Elk, E.....	10,000	4,100	Dump.....				13' 2"	17' 8"
G. M. C., K.....	10,000		Optional.....		4' 5"		Opt..	Opt..
G. M. C., K1.....	10,000		Optional.....		4' 5"		16'	21'
Gramm.....	10,000	4,500	Optional.....		Opt..	Opt..	Opt..	Opt..
Jarvis-Huntington.....	10,000	4,400	Delivery.....	4,825	Opt..		14'	
Jarvis-Huntington.....	10,000	4,400	Delivery.....	4,600	Opt..		14'	
Jarvis-Huntington.....	10,000	4,400	Furniture.....	4,775	Opt..		14'	
Jarvis-Huntington.....	10,000	4,400	Oil Tank.....	5,050	Opt..		14'	
Jarvis-Huntington.....	10,000	4,400	Stake.....	4,650	Opt..		14'	
Kadix, E.....	10,000	4,500			6' 6"		Opt..	19' 3"
Kisselkar.....	10,000	4,350	Optional.....	4,500	6'		14'	
Knickerbocker, 12-5.....	10,000	4,500	Optional.....		Opt..	Opt..	Opt..	Opt..

## TRUCKS OF 5-TONS CAPACITY—Concluded

NAME AND MODEL	CAPACITY, POUNDS	CHASSIS PRICE	BODY STYLE	PRICE WITH BODY	LOAD SPACE			Overall Length
					Width	Height	Length	
Kopp, M	10,000							
Lewis, 51	10,000	\$4,750	Platform	\$5,000	6' 6"	4'	14'	19' 6"
Lewis, 51	10,000	4,750	Side Dump	5,100	6'	1' 6"	12'	19' 6"
Lewis, 51	10,000	4,750	End Dump	5,000	5' 6"	1' 10"	12'	19' 6"
Lewis, 51L	10,000	4,750	Lumber	5,000	7'		14'	19' 6"
Locomobile, A	10,000	4,800						
Lord Baltimore, F	10,000	4,250	Stake		6'		15'	19' 4"
Mack, 5 ton	10,000	4,800	Optional		Opt	Opt	Opt	Opt
Mogul, M	10,000	4,400	Optional					20' 6"
Mogul, V	10,000	4,400	Lumber					20' 6"
Moore, 5 ton	10,000							
Old Reliable, V	10,000	4,500	Optional		Opt	Opt	Opt	18' 4"
Packard	10,000	4,500						
Peerless, TC	10,000	4,500	Optional					
Pierce-Arrow	10,000	4,500	Optional		Opt	Opt	Opt	Opt
Pope-Hartford	10,000	4,350	Platform	4,550	6' 6"	3' 5"	14'	19' 2"
Pope-Hartford	10,000	4,350	Stake	4,550	6' 6"	3' 5"	14'	19' 2"
Pope-Hartford	10,000	4,350	Cab Top	4,600	6' 6"	3' 5"	14'	19' 2"
Pope-Hartford	10,000	4,350	Platform	4,675	6' 6"	3' 5"	16'	19' 2"
Pope-Hartford	10,000	4,350	Stake	4,675	6' 6"	3' 5"	16'	19' 2"
Rowe, F	10,000	3,150	Optional		Opt	Opt	Opt	Opt
Sampson	10,000	4,750	Platform	5,000	8'	3' 3"	14'	20'
Saurer	10,000	5,000	Optional		Opt	Opt	Opt	Opt
Schleicher	10,000	6,000	Optional		Opt	Opt	Opt	Opt
Stearns	10,000	3,800	Stake	3,950	6'		12' 6"	19' 6"
Stearns	10,000	3,900	Stake	4,050	6'		15' 6"	22' 6"
Transit, V	10,000	4,500	Express	4,700	6'		14'	20'
Transit, V	10,000	4,500	Stake	4,650	6'		14'	20'
Transit, V	10,000	4,500	Combination	4,700	6'		14'	20'
Transit, V	10,000	4,500	Dump	5,000	5' 8"		12'	18'
Victor, 5-ton	10,000	3,650	Optional					
Vulcan	10,000		Optional		Opt	Opt	Opt	Opt
White, TC	10,000	4,500	Stand Platform	4,700	6' 6"	2' 5"	13' 3"	20' 7 1/2"
White, TKA	10,000		Dump	5,200	6'	Opt	11' 2"	19' 8"

## TRUCKS OF OVER 5-TONS CAPACITY

Alco, 6 1/2-ton	13,000	\$5,200	Optional		Opt	Opt	Opt	Opt
Hewitt	20,000	5,500	Optional		Opt	Opt	Opt	Opt
LaFrance, 6-ton	12,500	5,500	Platform	\$5,500	Opt		Opt	Opt
Mack, 7 ton	14,000	5,300	Optional		Opt	Opt	Opt	Opt
Peerless	12,000	5,000	Optional					
Randolph, R	12,000	4,500	Optional		Opt	Opt	13' 3"	Opt
Saurer	13,000	6,000	Optional		Opt	Opt	Opt	Opt
Smith, 6-ton	12,000	4,750	Optional					
Speedwell, X	12,000	4,400	Optional	4,500	Opt	Opt	Opt	Opt
Stegeman	12,000		Optional		Opt	Opt	Opt	Opt
Sternberg, 6-ton	12,000	4,750	Optional		6'	Opt	15'	Opt
Universal Truck	12,000							
Vulcan	12,000		Optional		Opt	Opt	Opt	Opt
Vulcan	15,000		Optional		Opt	Opt	Opt	Opt

## PUBLIC SERVICE VEHICLES

Akron, A			Bus					
Akron, A			Hearse					
Akron, A			Ambulance					
Akron, A			Patrol					
Armleder, B		\$2,200	Bus	\$3,000	5' 6"	6'	8' 7"	18'
Armleder, F		4,000	Patrol	5,200	5' 2"	6'	7' 4"	23'
Beck	2,000		Bus	1,600				16'
Croxtan			Taxicab	2,500				
Great Eagle, A			Ambulance					
Great Eagle, A			Funeral Car					
Great Eagle, A			Casket Wagon					
Great Eagle, A			Combination					
Lippard-Stewart, B			Undertaker					
Lippard-Stewart, B			Patrol					
Lippard-Stewart, B			Ambulance					
Lippard-Stewart, B			Bus					
Seagrave, C	*1,000		Hose Cart	5,000	4' 8"	1' 6"	10'	18'
Seagrave, D-2	*4,000		Hose Cart	5,500	4' 8"	1' 8"	10'	20'
Seagrave, G	*1,500		Hose Cart					
S. & S. 1,000	1,500		Ambulance	3,250	3' 11"	5' 4"	7' 6"	16' 3"
S. & S. 1,000	1,500		Casket Wagon	3,250	3' 11"	5' 4"	7' 6"	16' 3"
S. & S. 1,000	1,500		Hearse	3,500				16' 3"

\*Capacity in feet of hose.

## Road Under L Suggested

## Chicago May Be Able to Secure Some Relief from Traffic Congestion

THERE has been talk for some time in favor of setting aside certain thoroughfares in Chicago for motor truck traffic. This street either would be used exclusively for motor traffic or the motor trucks would be given preference. The chief debate has been as to what streets were most suitable and available, and the move only awaits the day when the number of motor trucks in use will justify the change.

While waiting for this change it is suggested by Motor Age that the space under the elevated running north and south might be set aside for this traffic without interfering with present roads. The space running south is already well paved but rarely used by vehicles. For several miles this stretch of pavement, in good condition for the most part, runs with hardly a break, offering a chance for speed with little danger, and a better road surface than available elsewhere. The drawback is that some of the elevated stations are set where they would interfere.

## Could Be Used for Motor Trucks

A very little work and changing could put this space to work, offer a thoroughfare for motor traffic without interfering with any horse streets, and at a minimum cost save the truck users many minutes a trip. The space at present is almost deserted, and hence virtually useless.

While the route running south from the business center is well paved for a considerable distance, the route north is not so good for the first part of the way, the elevated following streets paved with poor cobble. Farther out the line takes a route to itself, the space underneath being mostly grass and bare dirt. This, too, might be paved with especial reference to motor truck use, and set aside for this work exclusively.

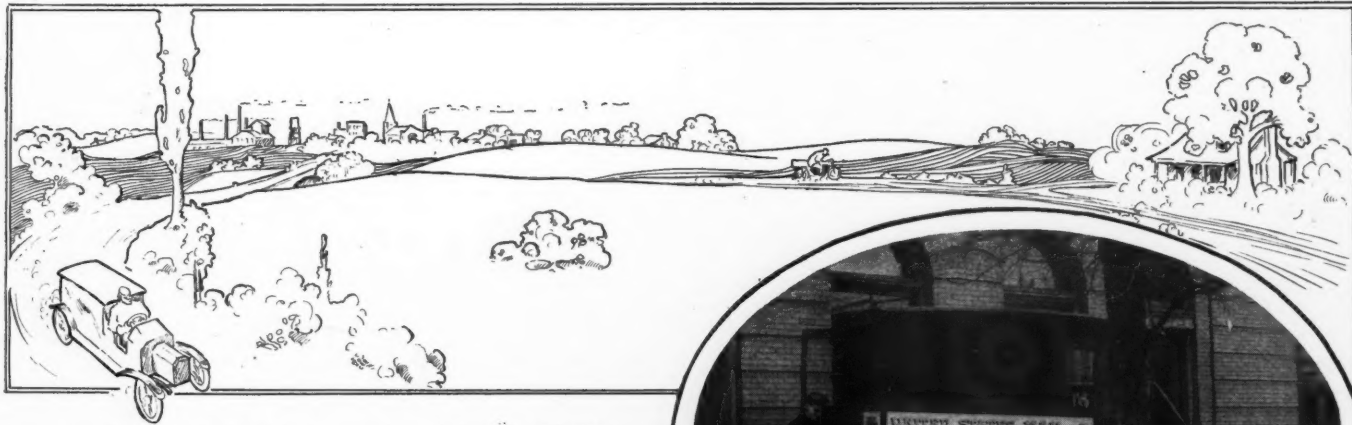
While a street for horse work and spiked shoes must be made to fit certain conditions, a concrete road, with possibly an oil composition surface, would be excellent for traffic which would not cut it up. A road for exclusive motor truck traffic might be put in cheaper than a road which would have to submit to the wear and tear of the hammering of horses' hoofs and shoes, and the grind of steel and narrow tires.

## Scheme Seems Feasible

Chicago is fortunate in having space already vacant which, for so little cost, can be made into so important a thoroughfare for goods hauling. By setting the elevated stations to one side, allowing room for the motor vehicles to pass, and enforcing a rigid slow-speed law at these points, the system could be made efficient and carried on without the hindrance to pedestrian traffic.



# Motor Cars and Uncle Sam's Parcels Post



*For rural delivery the light fast parcel-car is the probability as taking the place of the motor cycle commonly used now*

## Suggestions as to How Power Vehicles Could Be Used to Advantage in New Service Inaugurated by Government

UNCLE Sam, beginning the first of the year, has put into operation his new parcels post, but just what delivery vehicles will be used by the government in connection with the scheme is not as yet known. The government itself does not know how the new system of mail delivery will take with the public and hence does not know just what volume of business to expect.

Following out the uncertainty of knowledge post offices in general are planning to make as few changes as possible in their delivery systems until they find out just what is to be dealt with.

Chicago is planning to handle the extra work under contract with teaming companies, hauling the parcels by horse and wagon and assigning enough postmen to a wagon to make the deliveries to the homes. These postmen will deliver from the truck as do boys on the ordinary delivery vehicles of business firms, and the saving may mean that the government in some localities will use boys for parcels post package delivery.

### Must Educate the Public

It is probable the public will have to be educated to the use of the parcels post before the volume of business becomes very large, but when it comes in quantity the work will be much in common with that of department store package delivery, and it is not too much to assume that eventually it will be handled much as this class of delivery is done.

Parcels post delivery will be separate from regular mail delivery. There will be several differences which will make the problem simpler than that of ordinary mail work.

A letter postman stops at nearly every house on his route. The parcels post de-

livery vehicle will stop probably not once in three blocks average, and on the start the stops will be much farther apart than this, for the goods will be more scattered on account of the smaller bulk. As the volume of matter transmitted becomes greater the stops will become more frequent but probably will not soon exceed, in an average case, even in so congested a city as Chicago, more than one stop for every two blocks.

### Like Department Store Delivery

It is in this sense that the parcels post delivery will be much like that of department stores but the government has an added advantage in that the size of the package is limited and a body for a parcel delivery vehicle can be designed to very well fit the house-to-house work.

In handling the delivery, however, there will be a number of different types of vehicle needed. There probably will be big vans for hauling from the main post office to the substations and these may even haul mailbags as well and deliver them much quicker than by present methods. As the mail is sorted the packages can be loaded into crates or trunks so that the big trucks can use a quick-loading system to the substations. Arrived at these substations the trunks will be taken out and delivered to drivers of electrics who from this point will start their house-to-house delivery. These electrics will need to be designed for the quicker work of loading and unloading and for cheapness of running and upkeep, rather than for speed on the road.

There will also be small, fast, gasoline cars on pneumatic tires for use in parts of the city situated at a distance from

*A mail car on which time is lost by rear door delivery. Front delivery as with package companies would save hours a day*

substations and where the houses are far apart. These can do house-to-house delivery work very well where stops are not too frequent. Speed with them is a primary object, while lightness is an aid to going over questionable sandy and muddy roads. The bodies on these machines could be much the same as on the electrics except that one man might do the work on these distance machines while two will be needed on the others, and sometimes three.

For rural work on R. F. D. routes the motor cycle already is used with excellent results, a box on behind carrying the mail. When the bundles become larger, however, through the advent of parcels post, it is doubtful if a motor cycle can handle the bulk of the packages without the addition of a sidecar which would hinder its speed for country work considerably.

### Three-Wheeler Suggested

The three-wheeler with the two wheels and box in front has been suggested for this work and will be able to handle the work excellently where roads are good, but for rough roads some form of four-wheeled parcel car will have to be developed, with speed, low upkeep, simplicity and reliability as its chief features. Several of the smaller makes of pneumatic-tired vehicles now on the market no doubt will prove excellent for the longer runs especially, and the reliability of some of them is unquestioned. The hard-tired vehicle in small size will have to prove more reliable than at present before it can be taken seriously for coun-

try work, where high speed is a factor toward success.

Such is a possible outline of what will be required in parcel work such as the government is planning to handle, and manufacturers everywhere are anxious to know just what type of vehicle the government will want when it comes to buy motored vehicles for this work.

This also is conjecture but no doubt the vehicle will be given preference which can make the best showing with the fewest men. This will mean a good vehicle of course but along with that will be required a very handy body design which will eliminate every possible moment of idle time.

Suppose that thirty wagons were operating for a station say like Chicago. Take it for granted that each would deliver 100 parcels a day, or rather make 100 deliveries. Suppose that a regular substation mail truck, such as is shown in the sketch, were used for the house-to-house delivery of these 100 stops.

#### Method of Operation

When the vehicle stops the driver jumps off the seat, runs around to the back, unlocks the door, hunts for the parcel, finds it, locks the door and then starts to really make the delivery. At least 1 minute has been lost through the running to the rear. With 100 stops this would mean 100 minutes lost a day or 1 hour 40 minutes. With thirty wagons it is easy to see that the daily loss of truck service would amount to not less than 50 hours, or the service of more than eight trucks out of the thirty for an 8-hour day each.

If a way could be devised to save that 1 minute at each stop the government would be saved the expense of upkeep, interest, etc., on eight motor vehicles, the wages of eight drivers, and possibly of eight helpers! This minute can be very easily saved, as the department stores have proven in their work, by shutting the rear doors permanently and delivering from the seat. In this way the driver or assistant has the package in hand and is off the truck the instant it stops. This might be further assisted by an arrangement shown in the drawing of the suggested parcel body.

This body is fitted with a side door back of the driver's seat. This door should be on the right hand side of the car irrespective of where the driver's seat is. Back of the seat and on either side of the car are racks extending to the ceiling of the car, each of a size to take the average parcels post delivery package. At the side of the driver can be a special locked compartment for registered matter if this class is handled. This could be arranged under the window on the opposite side from the driver's seat but should not obstruct his view in any direction.

By this arrangement the driver can get quickly to the parcel part of the car, keep a constant watch over his helper, have more room for packages than if they were scattered promiscuously over the floor, as in the case in many department store package cars, and the helper has a very ready way to jump on or off the car while it is in motion without danger to himself.

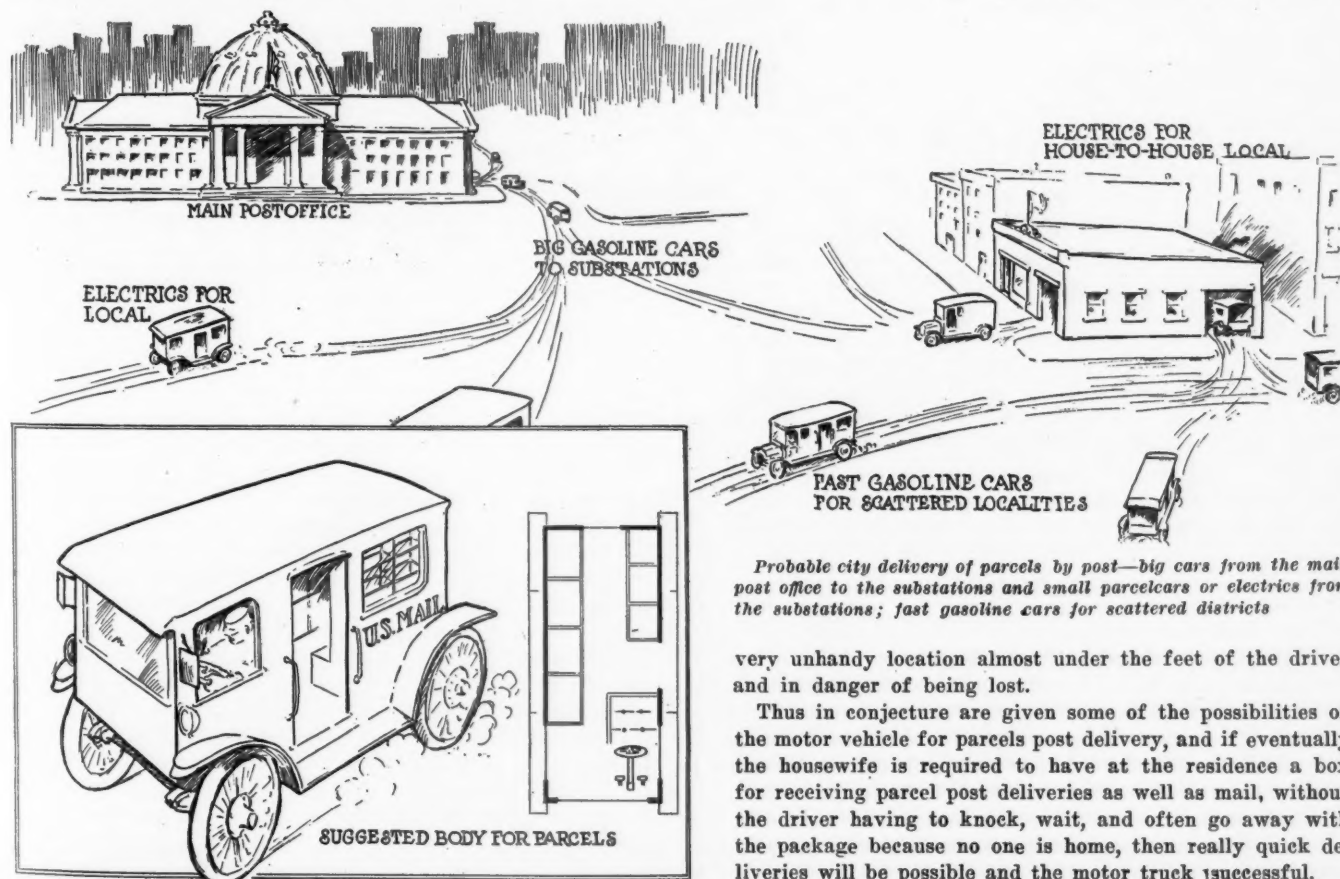
In riding on a car in package delivery service arranged so that the driver could leave with the package immediately on stopping, the writer found on a day's run that the average stop was under 2 minutes. With a car arranged as in the drawing and with a helper to facilitate things so as to save sorting, except when the car was running, this time should be beaten in favorable localities.

Where C. O. D. orders are to be handled to any extent motor vehicles will be very greatly hindered as the greatest part of the delays in package work come from this source. On a recent package trip though but 20 per cent of the deliveries were C. O. D. 40 per cent of the total standing time was devoted to their delivery.

#### Duties of the Helper

The usefulness of a helper on the package work will depend on how he is handled by the driver. The best truck drivers using boys for this kind of work often make a whole trip through their delivery territory after once starting without the boy or boys riding  $\frac{1}{2}$  mile during a 4 to 6-mile run. The helper should be away on delivery most of the time, the truck picking him up at this corner and that on schedule, and sending him away again with a fresh load.

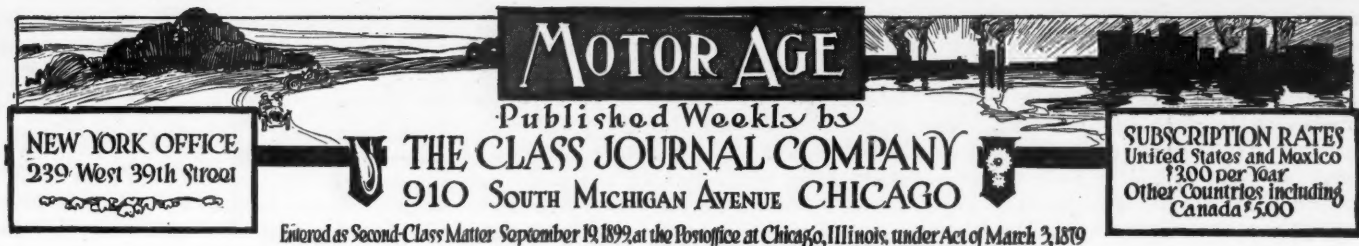
For this the new load must be sorted and ready before the helper arrives. The body design in the drawing shows a basket space for these sorted parcels at the door of the car to be used in good weather, so that the helper may find his packages ready. These are ordinarily kept on the footboard of the car at present, in a



very unhandy location almost under the feet of the driver and in danger of being lost.

Thus in conjecture are given some of the possibilities of the motor vehicle for parcels post delivery, and if eventually the housewife is required to have at the residence a box for receiving parcel post deliveries as well as mail, without the driver having to knock, wait, and often go away with the package because no one is home, then really quick deliveries will be possible and the motor truck successful.





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## Operating the Truck

**A**LTHOUGH the annual Chicago and New York shows afford an opportunity to the buyer of investigating the various types of vehicles suitable for his business, yet this selection is but one phase of his work, another great aspect of his motor installation is economizing time. Time is the Alpha and Omega of motor truck operation.

**T**IME can be saved in a variety of ways: One of the most important is proper loading and proper designing of body interiors for different industries. The box-like compartment in the 1,000-pound delivery wagon, in which the entire load rests on the floor, is inadequate for these days. It suited the horse regime, but must be improved upon if the motor is to make its best showing. This is particularly true in mercantile lines, in which several score of small packages make up a load for house-to-house delivery. The merchant delivering light-weight notions requires one style of body, the clothing man needs another, the millinery house a third, and other lines call for their necessary adaptations.

**O**NE big Chicago clothing house has announced that by using a series of hinged crates inside its delivery bodies, it is possible to reach the entire load of parcels from the driver's seat, thereby eliminating any necessity of using the rear door and thereby averaging an economy of 1 minute per delivery. With a force of wagons this means a big economy per day, a proportionately larger one per week and month and a most considerable amount per year. It is the little things that help out the balance sheet at the end of the year and interior body design for motor vehicles in house-to-house delivery work is an important consideration.

**B**UT with proper body design there remains a possibility of still greater economy. Where one or two boys are used per wagon, much depends on the ability of the driver to so arrange his stops that there is the minimum loss of time. Motor Age has conducted investigations in this respect which show that one driver can easily waste one-half hour on a delivery circuit by a poor selection of stopping places, and necessitating long waits of one boy on the other and so delaying the entire delivery. The solution rests only with the driver; if he has not sufficient gray matter it is impossible to effect the necessary economy. He is the master of the situation. In horse days the driver was not such an important individual, but with the motor he becomes a lieutenant of transportation, a quantity which is a factor in the economy of the house.

**I**T is because of this driver situation that so many concerns changing from horse to motor equipments insist on using their old drivers, in that they may have been schooled by the concern in the economies of delivery. It is because of this that business houses are today giving more attention to the education of the driver. Motor vehicle makers are establishing training courses for them in which they are familiarized with the details of the vehicles, but so often they are neglecting the great essentials of a business training for the work, for without the

business knowledge the expert driver may prove a poor investment to his employer.

**E**DUCATE the driver is the slogan of the day. Educate him in the mechanisms, care and operation of the truck, but by all means educate him also in the business of delivery. Get him into a realization of the value of time in truck economy. Not a few concerns using horse delivery systems have acknowledged that while they have installed the latest in scientific management within their plants they have organized separate corporations for their delivery work because the delivery work was so inefficient and costly that they did not prefer to have it show in the regular books of the company. Such an acknowledgment means inefficient help in the transportation work. It means a shipping clerk left to his own whims and often he is scarcely able to manage himself, not to mention the details of a delivery business.

**O**NE or two concerns have made great errors in installing motor vehicles by leaving too much to the shipping clerk instead of the department heads going rationally into the subject. One of such cases was a big mercantile house which left the selection of the vehicle bodies to the shipping clerk, who patronized a body builder that he had used in horse days. This builder was entirely ignorant of the requisites of motor vehicles and built bodies that were vastly too heavy for the vehicles, the additional weight being such as to appreciably impair the speed and general efficiency of them. When it came to the operation of the vehicles they were blamed and it was almost impossible to get the concern to see the error of its shipping clerk.

**B**UYING a motor vehicle is one problem, and properly operating it is a ten-times-greater task. The merchant or manufacturer should not blindly accept the verdict of his shipping forces, which were educated and brought up under the horse regime. What did for the horse often is failure for the motor. It is a new era of transportation, a period that calls for the closest scrutiny, the closest inspection of vehicles and systems.

**W**HERE to take the driver from has worried many a concern, but it is pretty generally decided now that better men are obtained by selecting carefully from the horse-vehicle field than trying to borrow from the chauffeur class. A chauffeur with a good job is generally better paid than the motor truck driver, so that the owner who aims to draw from this class generally has a poor selection; whereas, when he selects from the horse-vehicle field, he has the best to pick from. In nearly every city the owner is selecting from the horse-vehicle field. True such a driver requires education in the mechanics of the truck, but the truckmaker is coming to the rescue by special courses for drivers. Some of the more enterprising motor schools are establishing special classes for truck drivers, so that with the present activity in this driver-education work there is not any doubt but that within a few years there will be an adequate supply of reliable drivers, drivers who are not afraid to handle packages and drivers who have the gray matter to do the work as it should be done.

# The World's Progress

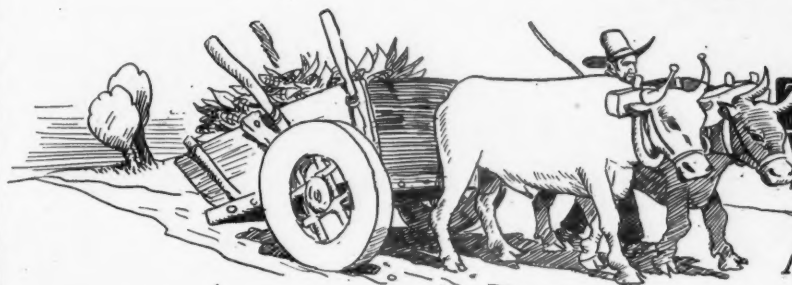
by J. C. Burton

The cave man in a prehistoric day,  
Bore on his back, a heavy, flinty load;  
Stumbling, falling as he picked his way,  
Or on a gentle dinosaur rode.



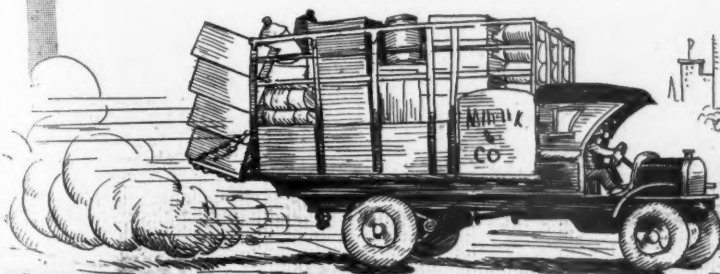
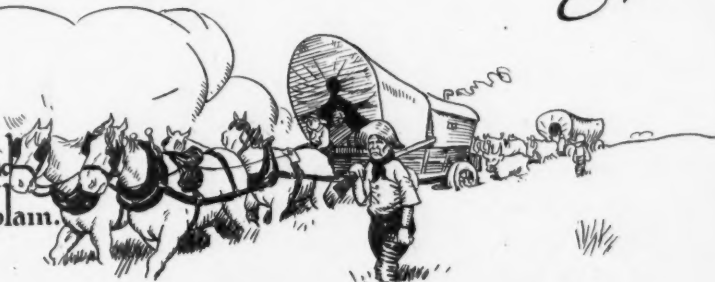
The ancient merchant, vagrant Jew of old,  
His mart, the world; his bed, a plot of grass.  
Loaded his wares, his precious gems, his gold  
Upon a sad-eyed, patient, humble ass.

The savage Indian, wrath by work incensed,  
When hostile tom-toms beat a redskin rag,  
Took the untamed broncho from the herd  
And tied him to a two-poled clumsy drag.



The plodding farmer, gleaner in the field,  
Wiser than they who dubbed him rural clown,  
Taught the ox to haul the golden yield  
And slowly pull it to a hungry town.

The pioneer who sought a rainbow's end,  
Unmindful of the tortures and the strain,  
Saw in the horse a staunch and faithful friend  
He pulled the prairie schooner o'er the plain.



The modern merchant, Science his ally,  
Sees Progress pointing to a distant ruck:  
The ass and horse are of a day gone by  
All hail the era of the motor truck.



# Thirteenth Annual Show in New York

Automobile Board of Trade Successfully Solves Problem of Housing the Industry in Madison Square Garden and Grand Central Palace—Former Represents Crystal Palace Idea and Latter a Palace of Versailles

NEW YORK, Jan. 13—America's first exhibition for this year of the motor car industry as a whole was opened Saturday night as the thirteenth annual national show, occupying both the Madison Square garden and the Grand Central palace. The exhibition is held under the auspices of the Automobile Board of Trade, and is handled by the show committee of that association, composed of Colonel George Pope, Alfred Reeves and M. L. Downs.

The exhibition is a 2-week affair. The first week from January 11 to 18 exhibits the pleasure vehicles and accessories in both the garden and the palace, while the second week will be purely a commercial vehicle display in both buildings.

By Darwin S. Hatch

There are 467 exhibitors of cars and accessories showing this week and 250 makers have been allotted space during part 2, or the commercial car week. This makes a total of 717 exhibits opened for public inspection for the fortnight. The 275,000 square feet of exhibition space in the two buildings will contain cars and accessories of a value estimated at \$5,500,000.

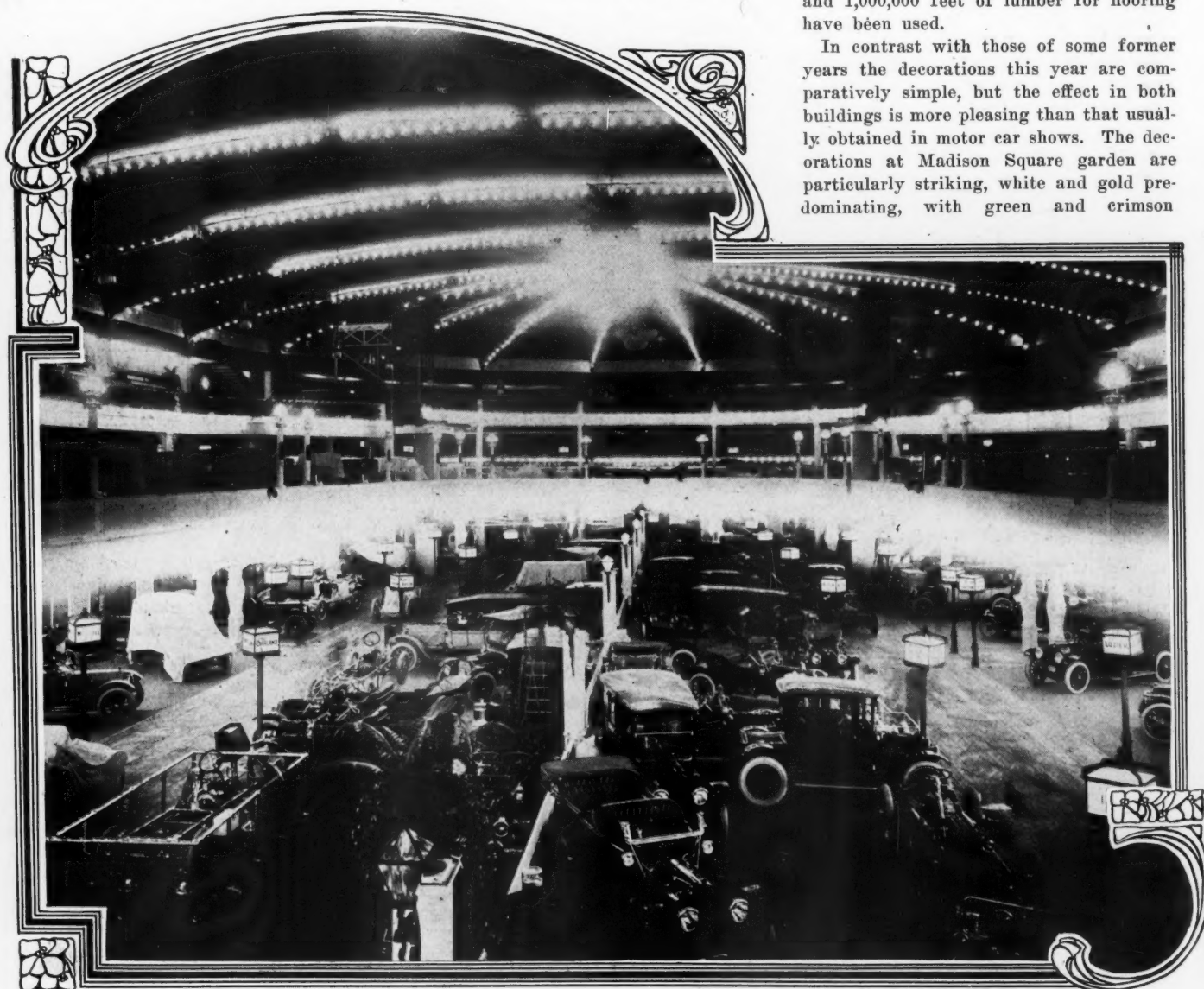
## New York Solves the Problem

For many years it has been a problem to house New York's annual exhibition of motor cars and accessories. Heretofore two separate shows have been held, managed by two separate trade associations,

and when the Automobile Board of Trade undertook to stage the combined show as one general exhibition the problem was solved by utilizing New York's two greatest exhibition structures.

Even with the addition of all the space available in the Grand Central palace, it still was necessary to rebuild the interior of Madison Square garden until the arena of the building bears scant resemblance to its customary appearance. Two galleries extending completely around the building have been built out 20 feet or more, and supported on great steel girders and pillars on the same plan as used in the construction of a steel sky-scraper. It is stated that for this temporary structure alone more than 200 tons of steel and 1,000,000 feet of lumber for flooring have been used.

In contrast with those of some former years the decorations this year are comparatively simple, but the effect in both buildings is more pleasing than that usually obtained in motor car shows. The decorations at Madison Square garden are particularly striking, white and gold predominating, with green and crimson



INTERIOR OF MADISON SQUARE GARDEN WITH ITS CRYSTAL PALACE DECORATIVE IDEA

# Attracts a Grand Total of 717 Exhibitors

Wire Wheels and Electric Starting and Lighting Systems Among Things Most Discussed—  
Body Designs Show Distinct Change from Former Years—Many  
New Motors Brought Out for this Year

strongly in evidence as relieving tones. A great canopy of more than 5,000 yards of blue cloth hides the massive girders of the dome from view. Three crystal chandeliers carrying twenty arc lamps are suspended from the roof and these in addition to 8,000 incandescents comprise the lighting arrangements.

The garden has been converted into a crystal palace by means of huge mirrors paneled along the side walls. These mirrors cover more than 5,000 square feet of the wall area. Lattice work has been used very extensively to cover the structural steel which forms the skeleton of the building.

## Decorations at the Palace

Decorations at the Grand Central palace have been such as to convert it into a palace of Versailles, with the walls adorned by mammoth paintings of American landscapes. Aside from the paintings the only other decoration is in the lattice work entwined with flowers and trailing vines, which relieves the pillars and balconies.

The exhibition spaces on the main floor of both palace and garden are covered

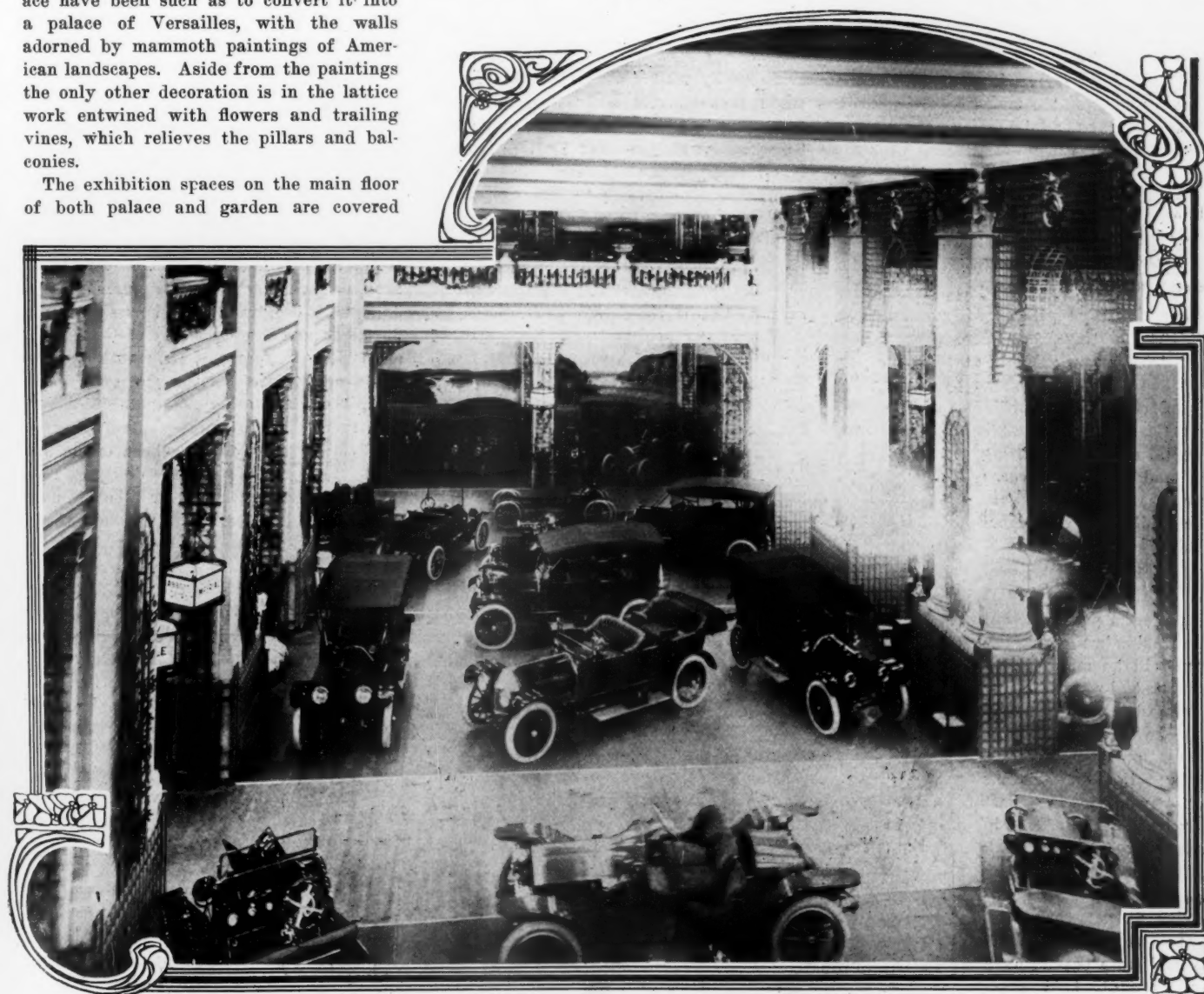
with a light green carpet to give the effect of the cars being on the grass. The various spaces are marked by huge illuminated transparencies bearing the name of the exhibits. As to the disposition of the displays, cars and chassis occupy the main floor of the garden as well as the first balcony, while the second balcony and the second floor of the concert hall as well as the basement are devoted to accessory makers. The first floor of the concert hall, which last year contained displays, has been converted this year into a restaurant.

The main hall of the palace, the mezzanine floor and a portion of the balcony is devoted to motor cars, while the remainder of the balcony has been set apart

for the accessory exhibitors. In general the space devoted to the exhibits is considerably less than was required last year.

## Calling the Roll

With so many additions to the industry as have appeared within the past 12 months, it is to be expected that the visitor will find a number of new faces among the cars on display. Among those appearing for the first time at the New York shows are the Ames, Chevrolet, Henderson, Edwards, Lenox, Little and Keeton. At the same time, there are a number of cars, which by their constant appearance in the past have caused the public to come to look for them, but which are not on display this year. Among these are the Thomas, Brush, Corbin, DeTamble,



LOOKING DOWN THE MAIN HALL OF THE GRAND CENTRAL PALACE





CEILING AND BALCONY IN MADISON SQUARE GARDEN

Elmore, Henry, Penn and several others.

Electrics are not as numerous at either building this year as in the past, chiefly because most of the makers were dissatisfied with their allotments at the palace, and many of them are holding separate displays at their show rooms. There are, however, two electrics to be seen at the palace, one of them the Hupp-Yeats and the other the Standard.

#### Some in Both Buildings

There are a number of concerns which are not satisfied with showing at only one of the buildings, but have taken space and are making exhibits at both the garden and the palace. Among these are the Splitdorf, Marburg Brothers, and Warner Gear Co. A good many of the tire makers and several of the lubricating oil and grease concerns are also showing at both the buildings simultaneously.

Judging from the people on hand Saturday it would seem probable that the double-headed exhibition will be more widely attended by the motor car trade than have any of the previous shows. There are many agents living in the distant cities who in the past have not found time to attend the New York show, but seemingly they are taking this opportunity to get their first glance at the 1913 field. Special train parties have been organized in practically every car-making

city of any size. A special train bearing members of the Chicago Motor Club pulled in Saturday just in time for the opening; the Indianapolis manufacturers and dealers arrived on a special train on Friday. This train was promoted by the Indiana Automobile Manufacturers' Association and in addition to the 100 passengers carried an orchestra and cabaret show.

Both Madison Square garden and Grand Central palace were closed yesterday to the public, but there was a great deal of activity behind the closed doors. Although to the casual eye both buildings seemed fully ready to receive visitors at the opening Saturday evening, there still was a great deal of work necessary Sunday to straighten things out to the satisfaction

of the exhibitors, and to install a few belated exhibits that had been delayed in transit. Those showing at the garden were fortunate enough to get all of their cars into the building on Saturday, but two of the palace exhibitors were not so lucky. The Norwalk people were disappointed and two chassis and a touring car of the new Norwalk underslung six did not reach the city in time for the opening. A portion of the Paterson exhibit also was delayed in transit, but it is expected to arrive here very shortly.

#### Busy Week for Everybody

This week will be a busy one for the motor car enthusiasts and those connected with the industry. Many organizations have planned dinners, most of which are scheduled to begin after the show closes in the evenings. Apart from the entertainment features there will be a number of serious meetings.

The social affairs commenced yesterday with a motor car trip of the Indiana Automobile Manufacturers' Association to a clam-bake at Coney island.

Of the accessories there is not the variety of new things, nor is there the number of unusual or freakish designs that has been noticeable in former years. This can be considered as an indication of a more stable condition of the industry because most of the exhibits show that they have been based upon accepted design and well tried construction. Details of the new accessories will appear in the January 30 issue of Motor Age. Among the magnetos, for instance, there is little that is unusual.

Practically all of the makers who have been represented in former years are on hand with designs which show simply refinements and improvements of their various types of apparatus, with nothing radically new to the field in general. However, there are some instances in which constructions have been adopted by firms who have been exponents of other designs formerly. At the Simms booth, for instance, there is a new system involving a low-tension magneto with the same induction coil as is employed for the battery ignition, which is interesting.

This is a departure for the Simms people who heretofore have been devoted to the high-tension principle. A Remy dual system of very much improved design is shown, and in the Marburg booth a new Mea waterproof magneto is offered in which spark advance and retard is obtained by change of position of the armature instead of by rocking the fields, which



GARDEN ENTRANCE WITH TRELLIS DECORATIONS

latter practice has been a feature of Mea design for many years. The Herz magneto is shown with an improved automatic timing arrangement; Splitdorfs appear in refined and more efficient design, with the Splitdorflite lighting magneto and combination ignition and lighting magneto as the leaders of the line. Bosch magnetos show refinement, but there is nothing startlingly new. The easy starting qualities of one Bosch system in particular appeal to those who are addicted to starting on the spark.

#### Changes in Carbureters

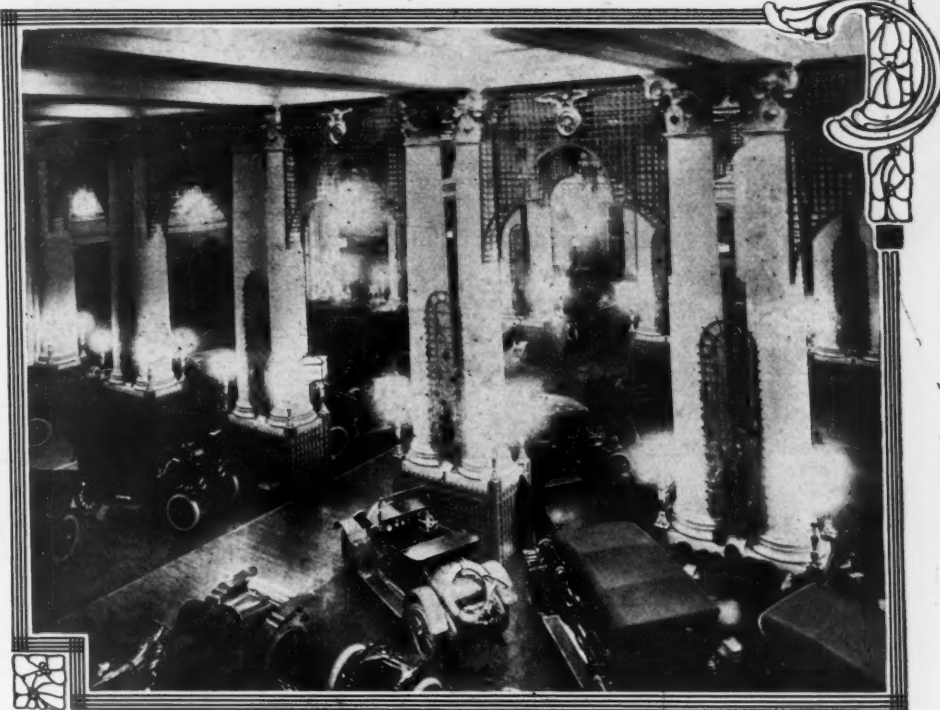
Carbureters show more changes than do ignition systems, and there are three new ones at the shows. One of these is the Sunderman safety carbureter, the feature of which is a valve in the intake passage which prevents a back-fire in the carbureter, and which is reinforced by means of a fire screen. The Motsinger people have come out with a carbureter which has a feature of automatic adjustment and is constructed on the double-jet principle.

The Homo company has incorporated the Homo mixing device in a carbureter of its own design, which is designed to be particularly well adapted to handle the low-grade gasoline on the market. There is a bewildering array of tires and tire accessories at the palace and garden, but it is noticeable that there is not the wealth of freak designs in non-skid treads that has been the feature of the tire display in former years. Practically all of the old designs of treads have been confirmed.

Wire wheels hold the floor as one of the chief attractions to visitors this year, and appear on at least ten different cars. These include the Edwards, Keeton, Pathfinder, Stutz, Fiat, National, Henderson and Premier. Both McCue and Rudge-Whitworth wire wheels are on exhibition, and practically all of the tire exhibitors, as well as some of the rim makers, are showing how their products work on the wire wheels. Most of the cars with wire wheels offer them as an option at an additional price of from \$100 to \$125 for a set of five wheels.

Electric starting and lighting systems are the features of the cars exhibited at both the palace and garden, as 80 per cent or more are fitted with electric equipment for cranking and illumination. These systems present a varied arrangement in the different installations, and the electric system seems to be the point of greatest interest to the visitors at the show.

The three or four cars



GIVING AN IDEA OF HOW THE PALACE LOOKS

which are shown without starting devices of some sort must needs have very remarkable features in other ways. From the questions asked and remarks made by the visitors the first day the public in general is somewhat better informed on the requirements of starting and lighting systems than most makers have supposed, and it is quite evident that the in order to attract the attention given to those with the ones without must act soon in order to gain the interest of the public as do their better equipped neighbors.

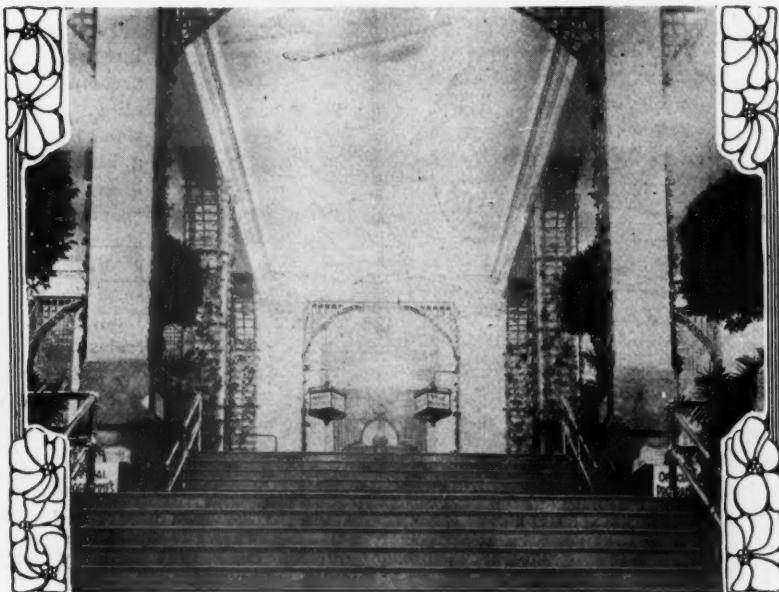
This year, more than ever before, is the influence of European design on American construction in evidence. Mitchell cars, for instance, which boast of the European origin of their design, have many fea-

tures which heretofore have been considered strictly French construction. Similarly the Edwards with its worm drive, wire wheels and Knight engine, has distinctly a European appearance. Likewise the new Stevens-Duryea cars, whose new bodies, sloping hood, low rakish lines and wire wheels are reminiscent of continental tours. The National has two European features, one wire wheels and the other the transmission brake.

#### Trend in Body Design

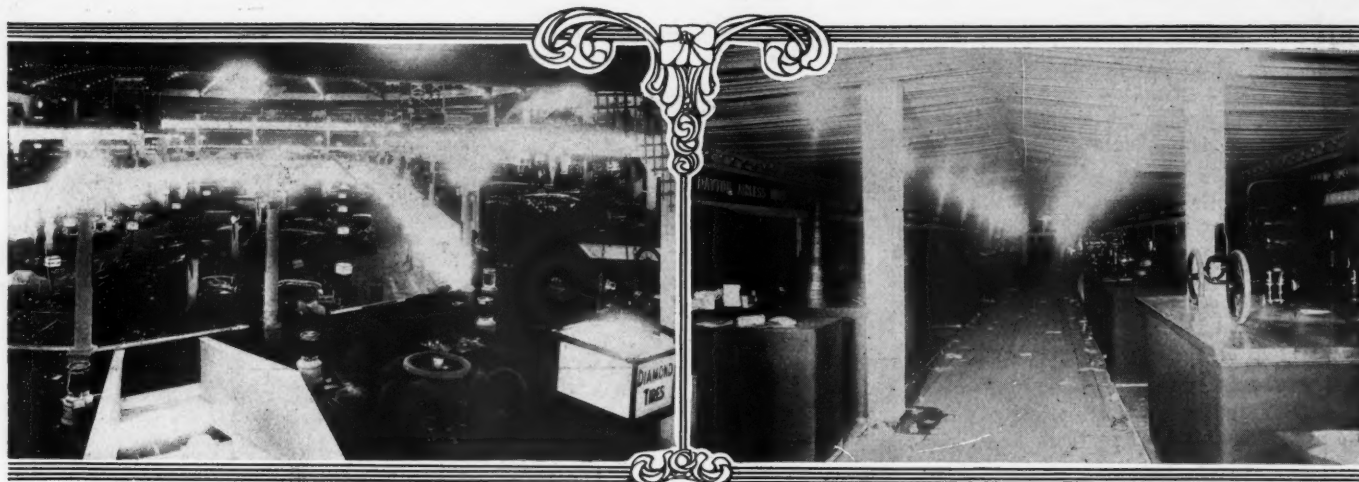
Body designs in general show a distinct change from those of former years, particularly in the field of the inclosed bodies, such as limousines, coupes and so on. The trend in closed bodies, as illustrated at the shows, seems to have proceeded in two directions, one toward the colonial style, in which the lines flare outwards toward the top, giving the upper portion a greater area than the lower portion of the body. In some cases this retrospection has proceeded even further, and the designs of the coaches employed in the time of Louis XIV have been drawn upon for models for car bodies.

The result in many cases has been a body whose lines flare outward to quite an exaggerated degree at the top. Such designs have carried with them changes in style of the lamps and other fittings, and also in the shapes and arrangement



ENTRANCE LEADING INTO GRAND CENTRAL PALACE





AMONG THE ACCESSORY EXHIBITS IN MADISON SQUARE GARDEN

of the windows. The colonial pillar type year is very much in evidence on the of lamp which made its appearance last colonial bodies and those reminiscent of



SOME NEW BODIES—LOCOMOBILE, BERLINE, MARMON, PEERLESS AND MERCER

the empire, while the windows have been divided up into small square or diamond-shaped panes, which are heavily beveled.

Inclosed bodies have developed a widely different direction when not of the colonial type. There has been a tendency on the part of some towards that smooth stream-line effect which has become so popular in Europe. This has been particularly well adapted to some cars where it is desired to give the appearance of speed. In this type of body the lines have been made as smooth as possible with long flowing curves, oval or rounded windows, bullet-shaped or countersunk lamps, and deep cowl.

So far as the interior of the bodies are concerned, there has been a deepening of upholstery in practically almost every make of car. This has proceeded so far in some designs that the distance between the floor and rear cushion has been made almost nothing, the cushion seeming to be placed directly on the tonneau floor. This, with the increased wheelbase and better and longer spring construction, has made the cars in general very appreciably easier as to riding qualities.

#### Interior Body Fittings

In the matter of interior fittings of inclosed bodies, there has been very much accomplished in improvements of the paneling. In some instances a high grade of wood has been used, one concern flaunting a bird's-eye maple. In others there has been employed hand-tooled leather. In the majority of cases, however, the more common cloth paneling is used. Such fabrics as Bedford cord and similar weaves seem to have come into favor, and the tendency has been in coloring toward neutral shades, which have the advantage of not showing the dust, and also are not so likely to clash with milady's color scheme in costumes.

One of the notable exhibits is that of the American Locomotive Co., which consists of a single car placed on a high platform which is reached by a flight of steps. Its elevation above its fellows, and the very high sheen of its polished sides, give it a prominence that makes it the

center of interest to the motor public.

The most interesting feature of the Premier exhibit is a new inclosed body seating two or four persons, which is termed by its makers a touring coupe. The general color scheme is a light green and the type of design as a whole has a touch of colonial. This car is equipped with wire wheels.

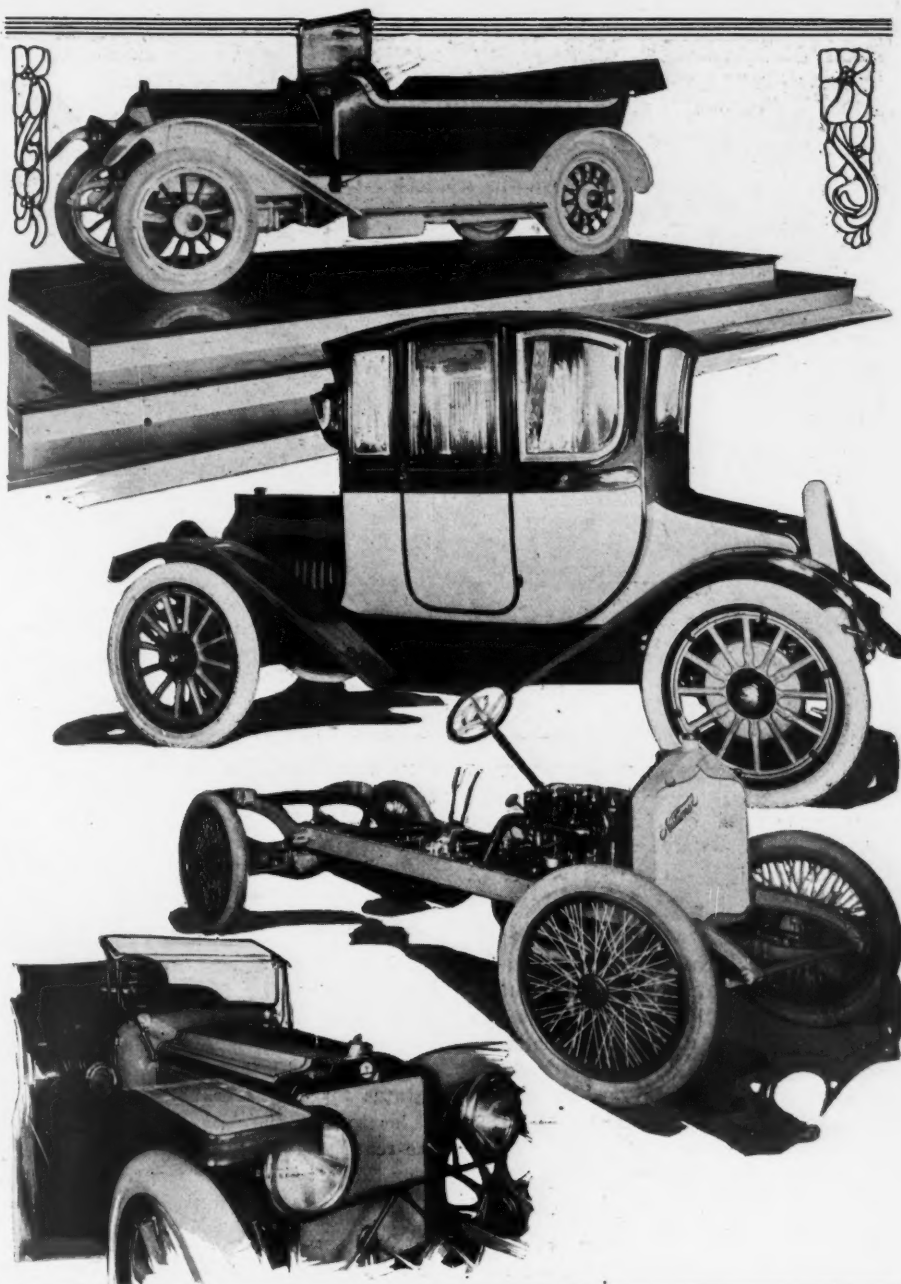
Another evidence of European influence is the V-shaped and D-shaped radiators which have made their appearance at the show for the first time. The Jackson has a radiator of the D-shape rather than the pointed type which is more popular among those who are trying to get away from the flat radiator. Some of those with the angular radiator are Knox, Imperial, Austin and Abbott-Detroit. The Abbott-Detroit was the only exponent last year of the V-type radiator.

#### Underslung Springs Appear

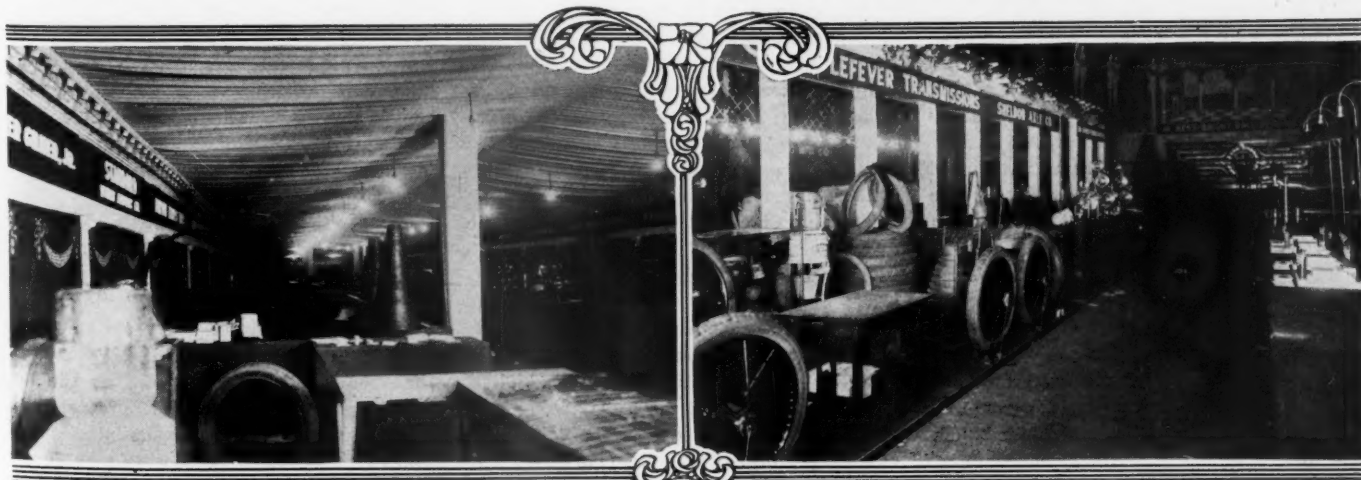
Students of car construction at the show this year will notice a very pronounced gain in the popularity of the underslung springs. The Franklin, which was a pioneer of this method of suspension and has employed it for over 5 years, naturally heads the list. Others adopting the underslung spring hanging are the Garford, Oakland, Franklin, R. C. H., Abbott and Mitchell.

Next to electric lighting and cranking systems probably there is no one other thing which shows a greater gain in popularity than the six-cylinder motor. Of the new motors to be seen at the show, fully one-third are six-cylinder variety. The new Garford six, for instance, has several novel features, and which were explained in detail last week. The most remarkable, perhaps, in showing the development of the year is the employment of the hollow crankshaft with curved cranks, illustrating the effort to combine small weight with strength. The Stevens-Duryea is an example of another trend in motor construction this year, that is, towards compactness without sacrificing accessibility.

The Knight motors of the Columbia, Stoddard-Dayton, Stearns, and Edwards are surrounded by a throng of inter-

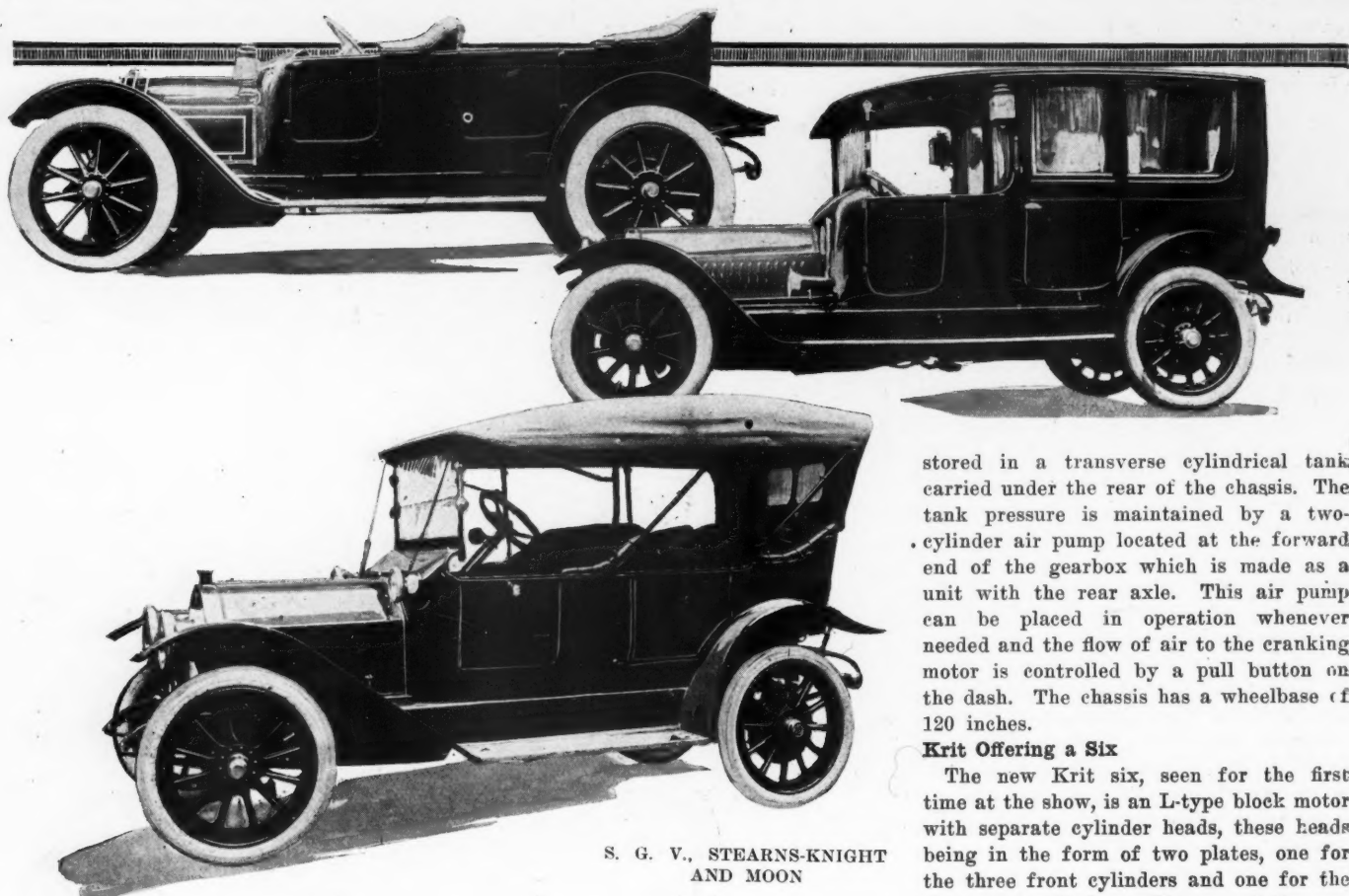


ALCO'S ONE-CAR EXHIBIT, MOLINE COUPE AND WIRE-WHEELED NATIONAL. AMERICAN SIX SHOWING NEW BONNET AND SMALL ELECTRIC DASH LIGHTS WHICH IS ATTRACTING ATTENTION



SCENES IN THE EXHIBITS OF ACCESSORY MAKERS AT NEW YORK SHOW



S. G. V., STEARNS-KNIGHT  
AND MOON

valve engine seems to continue to as protested spectators. The interest of the average show visitor in the sliding sleeve-nounced a degree this year as it has previously. The new rotary-valve motor of Mead design, which is a feature of the Speedwell line for the year, and which was described last week, also comes in for considerable attention.

Comparing the garden and palace shows, it is apparent that there are more new motors seen at the palace than at the garden, although in the latter there are not a few new designs. The advent of sixes is largely responsible for the palace additions, and the majority of the new ones are six-cylinder types. The Imperial six-cylinder motor shown in a chassis with 137-inch wheelbase is a block type with cylinders 4 by 5.5 inches. While the casting is a block design the cylinders are grouped in pairs in the block, giving roughly the appearance of pairs arrangement and allowing for the use of a four-bearing crankshaft, the same as would normally be used with a six having the cylinders cast in pairs.

#### Imperial Chassis Design

The chassis of this Imperial has some new features, one being the underslinging of the three-quarters rear springs and another the continuing of the frame side members rearward and curving them down to form a bracket for carrying the cylindrical gasoline tank. The door hinges are hidden in the body work, not showing with the door either closed or open. The two sets of rear axle brakes are arranged

concentrically. A Northeast cranking motor is fitted as regular equipment on the Imperial.

The new American six is a T-head block casting with cylinders 4.5 by 6 inches. The Electro motor-generator apparatus for engine cranking and lighting is located on the left side alongside of the rear cylinders. The ignition magneto is on the left side at the front. The motor is fitted it a standard Traveler underslung chassis. The wheelbase measures 140 inches. Tires on the American six are 39 by 5 inches.

In the Inter-State six not a few new details with this concern are incorporated. The motor is a T-type block casting of clean-cut design, having the gearbox as a unit with it and the chassis being designed with left-hand steering wheel and center levers gives a clean chassis. The cylinders measure 4 by 5 inches; an Apleo motor-generator for cranking and lighting is fitted, and the chassis wheelbase is 132 inches. The four-cylinder models of this concern are on exhibition.

The new Chevrolet six, with cylinders in groups of three and measuring 3½ by 5 inches, uses a specially balanced crankshaft in that the cheeks between the throws are arc-shaped so as to bring the weight into the axial line of the shaft thereby giving a better balance, which is shown by the shaft on a balancing machine. A motor feature is the rotary air cranking motor which is geared to the flywheel. This rotary air motor is rotated from air pressure of 200 pounds

stored in a transverse cylindrical tank carried under the rear of the chassis. The tank pressure is maintained by a two-cylinder air pump located at the forward end of the gearbox which is made as a unit with the rear axle. This air pump can be placed in operation whenever needed and the flow of air to the cranking motor is controlled by a pull button on the dash. The chassis has a wheelbase of 120 inches.

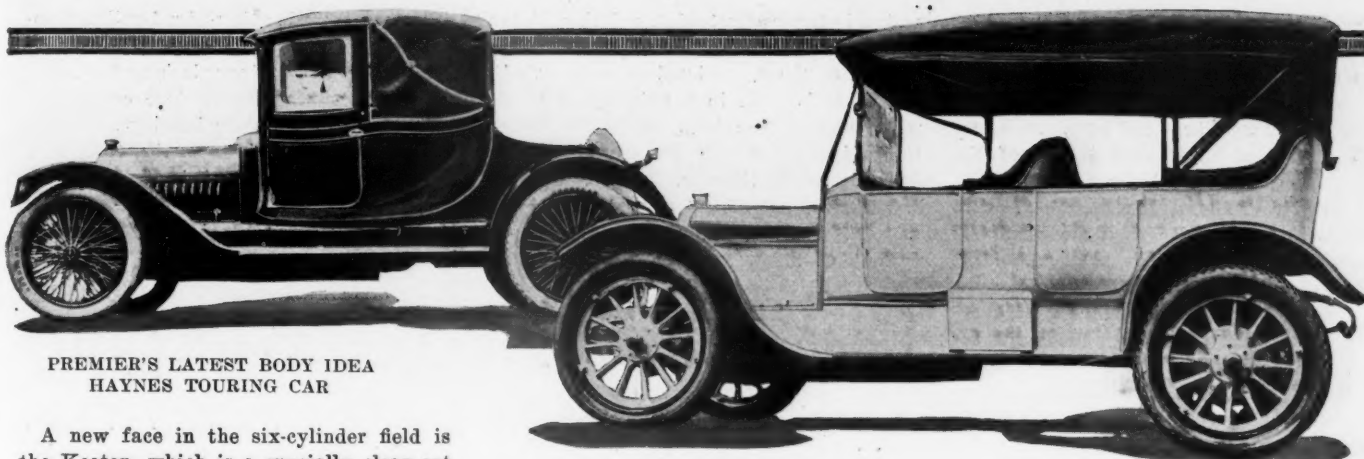
#### Krit Offering a Six

The new Krit six, seen for the first time at the show, is an L-type block motor with separate cylinder heads, these heads being in the form of two plates, one for the three front cylinders and one for the three rear cylinders. The use of the separate heads is to afford accessibility to the valves and also for the removal of carbon from the cylinders. These separate heads extend over the valve chambers and eliminate the usual threaded plugs over the valves. The chassis uses a multiple-disk clutch, three-speed gearset and the well-known Krit underslung elliptic rear springs. The motor sixes are 3.25 by 6 inches; the wheelbase measures 122 inches, and tires are 34 by 4 inches.

#### The New Edwards-Knight

The new Edwards-Knight motor has been recently described in these columns, and will be omitted here, other than to state that it is the latest two-sleeve Knight design, with its four cylinders cast in pairs. The motor carries an S. U. carburetor and multi-cylinder air pump for tire inflation. All of the Edwards-Knight cars are fitted with detachable wire wheels, worm drive and the Lanchester type of one-quarter elliptic rear springs, in which the spring weight is carried on the car frame and not as dead weight on the axle.

The new Stutz six is shown in a polished chassis. The motor is made up of three groups of twin castings with opposite valves, the design being similar to that in the four-cylinder types. The cylinders are 4.25 by 5, smaller than in the fours, so that the piston displacement of the six is only about 35 cubic inches greater than that of the four. The chassis uses the Stutz type of combined rear axle and gearset which has been before the American buying public for several years.



PREMIER'S LATEST BODY IDEA  
HAYNES TOURING CAR

A new face in the six-cylinder field is the Keeton, which is a specially clean-cut job with a six-cylinder L-type block casting. There is a short cross shaft in front on which the Mea magneto is mounted. Thermo-syphon cooling is used in connection with a Renault type radiator mounted at the dash. The steering wheel is on the left side and center control is used. All models are fitted with wire wheels.

A new four-cylinder motor is used in the King car. It is an L-type with cylinders in pairs and has combined with it the Ward-Leonard cranking motor and lighting generator. The new chassis is largely made up of conventional chassis parts, but continues the patented Lanchester type of rear spring.

#### Vellie Motor Construction

The new Vellie 32, a four-cylinder motor, uses a cross shaft for the magneto, which is mounted on the right end. The cranking motor and lighting generator are mounted on the right side, and the carburetor is carried nearly on a level with the cylinder heads on this side. The water pump is also on this side, placed lower than the lighting generator. Grouping the majority of the motor appurtenances on the right gives a clear right-of-way for left hand steering with center control, the gearshift and brake levers being mounted on the top of the gearbox.

In the Fiat booth is seen the new four-cylinder model 55, the new model for this season. It is one of the best examples in the building of clean-cut block motor design with the cross shaft for magneto and water pump. The exhibit also contains an attractive red roadster on the 55 chassis. It has a comprehensive tool box at the rear, which is made up of three parts: First is a hinged false lid in which all of the wrenches and many tools are embedded; beneath this are several compartments for cans, etc., and in the bottom is a third compartment for waste, etc. The company has announced that it is fitting the Westinghouse cranking motor, which is geared in the flywheel in the conventional manner. Wire wheels are shown on the roadster model.

All styles of bodies are shown at the garden, where they fill the ground floor and the interior row arranged along the balustrade which surrounds the open

court in the center. Touring and limousines are in the majority and it would seem as if the latter class of bodies has gained since last year, which is perhaps due to a tendency of producing more comfortable motor cars than ever before.

#### Shows Designers' Ability

Nevertheless, a sufficient number of roadsters, runabouts and coupes are shown to afford a good idea of what motor car manufacturers have done in this respect for the purchaser of a 1913 product. In the open cars the tendencies of design which have begun to evidence themselves a year or so ago continue, having gained ground rather than lost during 1912. These tendencies are stream-line bodies, fore-doors, clear running board, carrying of the tires in the rear and the use of electric lights, especially for the head lamps.

Among the cars selling from \$2,500 upwards more than nine-tenths of the makes are equipped with this type of illumination systems and in a few cases acetylene lights are standard with an option of electric equipment. The use of self-starters which is becoming more and more general in this class also serves to alter the appearance in many cases, as several companies have done away with the starting cranks, thereby changing the looks of the car front. The wheelbases, which have been lengthened in most instances, also impart to the car a speedier appearance than the 1912 average car had. Finally the height of the closed doors has been reduced in more than one case and has been reduced relatively by the lengthening of the wheelbases so that the general appearance of the 1913 product, that is to say, the limousine and coupe, is slightly lower than what it was on the models of last year.

#### Body Designing in Good Taste

It may be said without flattery that every car shown in the garden this year illustrates the good taste and the ever improving sense of beauty on the art of the American body designer. The novel principles of body design which began to make themselves felt several years ago have been incorporated in every case and without imitating the work of European makers, Americans have succeeded in cre-

ating a beautiful, harmonious and useful product which is best fitted for the specific requirements obtaining at this day in our country. There are few cars in the garden which suggest even a similarity to European design and in these cases they resemble British body designs rather than continental ones.

Proceeding now to specific instances one might say that the most striking body shown in the garden is the touring roadster of the Premier company. This car is built for two passengers, as its name implies, and has a most original appearance, reconciling some distinctly foreign features with American principles of body design. The car is painted in a green which may hardly be styled otherwise than screeching, but which gives a singularly pleasing effect in combination with the dark red used as a trimming so to speak on this green body. The top is also painted green and increases the pleasingness of the general effect. The car runs on wire wheels, is equipped with left-hand drive and the inside of the body is finished in bird's-eye maple woodwork which tends to make the whole creation still more splendid.

#### Locomobile's Star Attraction

Another product which ranks in beauty with anything hitherto produced in America is the Locomobile limousine which is finished in dark red and black, the red serving to raise the black, being applied in the nature of an Alco type of stripe which runs along the window line of the car. The front or driver's compartment is finished in dark, which has the effect of concentrating the onlooker's attention on the interior of the car, which indeed is worthy of admiration. It is finished in old rose damask woven with a pattern of flowers and is equipped with all the refinements of a drawing room, suggesting comfort to the passenger. It is attracting considerable attention.

The Cartercar runabout is one of the many examples of cars in which all the new ideas have been put into practice. This car carries its fuel tank under the dash cowl and behind the passenger compartment there is an ample space for tires and baggage, covered with a rearwardly



extending casing, the downward flare of which makes for the speedy appearance of the entire car. These features, however, recur in relatively many cases and all the instances cannot be cited here.

The Stevens-Duryea car is one of the products distinguished for foreign looks. The latter is due to the use of wire wheels in combination with the peculiarly formed, flaring, cowled dash and large rounded mudguards of pressed steel.

A cowl dash which converges very noticeably toward the front end of the car is also the feature which lends a foreign appearance to the Mitchell four which is exhibited on the ground floor of the garden.

One of the features seen for the first time at this show is the use of a horizontal plate in front of the radiator base of the Stearns cars. This plate obviously serves to protect the radiator against mud splashing and the crank is so arranged that it hardly projects beyond the front line of this plate. It is hardly believable how this one detail of design serves to finish off the front of the car, being assisted in this work by the Stearns radiator cap ornament, the well known knight which has been chosen some time ago as a fitting suggestion of the sleeve motor used in the Stearns.

#### Examples of Body Building

There are, of course, a great many other instances of striking and good looking body design, the makers of Packard, Pierce-Arrow, Lozier, Alco, Peerless, Marmion and White, as well as Hudson, Franklin, Overland and Chalmers having exerted every effort to produce products which are as pleasing in appearance as they are efficient in operation. Many of these bodies have been illustrated in the issue of January 9 of Motor Age, or have been shown in connection with car descriptions which appeared during the latter months of 1912.

The way in which the motor cars were shown also deserves mention. Every booth was fitted with a line of strong incandescent lamps which threw plenty of light on the exhibits and brought out their colors and features of design to greatest advantage. In the evening the illumination furnished by the smaller lights distributed all over the building is being reinforced by three large electroliers arranged along the longitudinal center line of the roof and casting a sea of light over the exhibits arranged in the center of the ground floor and along the railing of the upper floors.

In addition to its incorporation in a Speedwell product, the Mead rotary-valve motor appears at the palace also as the sole exhibit of the Locomotive Foundry and Machine Co., the only other licensee under the Mead patents. In appearance and general construction it is very similar to the Speedwell product.

What is probably the highest priced motor at the shows is the new Julian motor,

which is the product of the Julian Motor Co., Syracuse, N. Y. It is of six cylinders, T-head, of the exceptional dimensions,  $4\frac{1}{2}$  by 7. It is built in a unit power plant, with valve-mechanisms inclosed. From these inclosures the carbureter air is drawn. One of the remarkable features is the employment of but two sizes of bolts and nuts in the entire engine. The crankcase is of aluminum and incloses a  $1\frac{1}{2}$ -

gallon reserve oil tank, and a 1-gallon gasoline tank. The motor is lubricated throughout by the circulating-splash system, and no grease cups are used. The crankshaft runs on four large plain bearings. Refinement seems to have been carried to a point in this motor, and, while it is of remarkable simplicity, all parts are easily accessible. It is said to develop in excess of 100 horsepower.

## Big Trade Bodies Merging

### Automobile Chamber of Commerce to Be Successor of Both National Association of Automobile Manufacturers and Automobile Board of Trade—Other News

NEW YORK, Jan. 14—At the annual meeting today of the Automobile Board of Trade the fifty-one members present unanimously voted in favor of amalgamation with the National Association of Automobile Manufacturers under the new name of the Automobile Chamber of Commerce. As a majority of the members of the N. A. A. M. also have voted favorably, it is but a matter of form until the amalgamation takes place and the time-honored name National Association of Automobile Manufacturers becomes a matter of history, and with it will go the more recent organization, the Automobile Board of Trade, which came into being after the decision against the Selden patent 2 years ago, which brought about the end of the licensed association and out of which came the present Automobile Board of Trade.

The new Automobile Chamber of Commerce will be hailed by all, as it means the end of the dual organizations which have been practically covering the same field. For example, the N. A. A. M. has at present 105 members and the board of trade has sixty-five, and of these sixty-five all excepting one also are members of the N. A. A. M.

There yet remains much to be done before the final act will be accomplished, and the dissolution of the two present organizations accomplished. Each organization will get the unanimous approval of its entire membership roster. A charter will then be applied for the Automobile Chamber of Commerce and a general meeting of the membership of both organizations called, at which meeting the organization of the new body will take place.

It is expected that the articles of incorporation will be practically identical with those of the present board of trade. When the chamber of commerce is formed all of the present membership of the two organizations will be permitted to join and the open-door policy will be extended to all outside manufacturers.

At the meeting today the Automobile Board of Trade re-elected its officers of the past year, namely: Charles Clifton, president; C. C. Hanch, vice-president; R.

D. Chapin, secretary; George Pope, treasurer; H. A. Bonnell, general manager, and the following directors: Hugh Chalmers, John N. Willys, S. D. Waldon, W. C. Leland and S. T. Davies.

#### PANAMA MOTOR SHOW PLANNED

New York, Jan. 14—America may have in 1915 at the exposition in San Francisco one of the greatest motor car exhibitions. Negotiations are under way looking to the erection of a separate building for an exhibit to continue throughout the exposition. Captain Baker, of the exposition, took up the matter of the building with prominent motor car manufacturers nearly 1 year ago and since then work of bringing the exposition authorities and the car makers together has continued.

This week the National Association of Automobile Manufacturers received word from San Francisco stating that the exposition company will erect a special building of 210,000 feet space exclusively for motor cars, motor cycles and accessories. The building will be one story high, 600 feet long and 350 wide.

So far the proposal has not been definitely accepted, but is being referred to individual concerns, and no difficulties are expected. The plan, in case of acceptance, is to handle the exhibit space similarly to national shows. Foreign manufacturers will receive the same opportunities.

The completion and occupancy of the building will mark the beginning of a new era, being the first instance of a separate building devoted to the motor cars, motor cycles and accessories at a world exhibition.

The matter was discussed at the regular monthly meeting of the executive committee of the N. A. A. M. Other matters also came up.

Indianapolis was added to the N. A. A. M. circuit of local shows. The dates will be March 24 to 29, inclusive.

The contest committee reported a tentative agreement with the contest board of the American Automobile Association relative to the control of contests under which it is contemplated that the N. A. A. M. will take the place of and perform

most of the functions formerly exercised by the Manufacturers' Contest Association.

It was decided, after consultation with the tire committee of the Motor and Accessory Manufacturers, to recommend that all cars be excluded from their warranties whose pneumatic tires have been so treated that there has been any substitution for the air cushion.

C. B. Warren was elected to membership

as representative of the Haynes Automobile Co.; E. O. Sutton as representative of the Knox, and J. T. Rainier as representative of the Garford.

#### EDGE IN ACCESSORY FIELD

London, Jan. 1—S. F. Edge has accepted the position of chairman of the United Motor Industries, Ltd., which represents D. W. F. bearings, Mea magneto and other accessories in Great Britain.

## United Motors Sale Made

### Court Accepts Bid of Reorganization Committee—Name of Standard Motor Co. Found Conflicting so Change Is Made to Maxwell Motor Co., Inc.—Weed Wins Suit

NEW YORK, Jan. 14—Judge Hough, of the United States district court for the southern district of New York, ordered the sale of the assets and good will of the United States Motor Co. and its subsidiaries to the reorganization committee under the condition that the latter agrees to pay all unpaid expenses and obligations incurred by the receivers in the administration of the properties, all compensation to receivers and auxiliary receivers and their attorneys and the following percentages on all claims as finally adjudged against the following companies: United States Motor Co., 32.5 per cent; Alden Sampson, 24 per cent; Brush Runabout, 33; Columbia, 91; Dayton, 39; Maxwell-Briscoe, 60 per cent.

The Standard Motor Co. was incorporated January 11 under the Delaware laws with a capital of \$31,000,000 to take over the property and business of the United States Motors Co. As the name of this organization was found to conflict with the name of other companies, the name was changed Monday to the Maxwell Motor Co., Inc. The Delaware incorporation stands.

Judge Hough signed the order transferring the property of the United States Motors to the new company Saturday. The transfer was effected Monday. Legal representatives stated that 98 per cent of the company's affairs will be settled February 15.

#### WEED WINS ANOTHER DECISION

Chicago, Jan. 11—Again affirming the validity of the Parsons chain-grip patents, under which the Weed Chain Tire Grip Co. is the sole licensee, the United States circuit court, last Tuesday, upheld the claims of the Weed interests in the appeal from the district court by the H. Channon Co. A preliminary injunction was granted as a result of the original hearing, before Judge A. L. Sanborn on April 25.

The appeal hearing was granted for the October term of the United States circuit court of appeals, Judges Baker, Seaman, and Kohlsaat, sitting. In the decision handed down by Judge Baker, the following evidence was considered: That

the Parsons patent No. 723,299 relates to an anti-skidding means held across the tire by two rings, one at each side of the tire, of smaller diameter than the tire, but held so loosely that the anti-skidding means may travel circumferentially around the tire, and thus not injure the tire, as would anti-skidding means held rigidly on the tire. The appellant held that whereas the Channon device employed a means of attaching the side-rings securely to the tire, so that the anti-skidding means would not creep on the tire, and that it was sold with instructions that it be so used it was not infringement on the Weed device.

The court ruled, however, that whereas the device manufactured by the Channon company was identical with the Weed device, except in this particular, the securing means was a cover and a sham, and that as the creeping ability of the original device was desirable, the user could innocently remove the securing means, to protect the tire; and that therefore, the Channon device was an infringement on the Parsons patents.

#### PACKARD MAKES ANNUAL REPORT

Detroit, Mich., Jan. 13—In a report just issued by Henry B. Joy, president of the Packard Motor Car Co., to the directors of the concern for the fiscal year ending August 31, 1912, it is shown that the concern's gross sales including commercial vehicles have increased from \$11,624,588.37 in the previous year to \$14,613,057.27 in the year covered by the report. The gross earnings for the current year were \$3,412,862.05. Deducting from this the depreciation of buildings, machinery, tools and development leaves net earnings for the year of \$2,182,376.20.

Subtracting the dividends upon the preferred stock, which amounted to \$350,000, the net surplus for the current year is \$1,832,376.20, which amount swells the total surplus—considering that which was on hand at the beginning of the fiscal year—to \$4,816,398.01. From this total the board of directors has authorized deductions to reduce the amount at which "rights, privileges, franchises, etc.," be

carried on the books from \$3,274,958.89 to \$1.00 and to adjust the books to the inventory taken December 31, 1911, by the charging off of \$342,656.30, leaving a final net surplus on August 31 last of \$1,198,783.82.

The capital stock of the Packard company is \$10,000,000 which is equally divided between common and preferred. In the general balance sheet, the resources include real estate valued at cost at \$285,312.49, buildings at \$2,084,865.81, machinery at \$1,145,381.22, and material stock, consisting of raw materials, that in process of construction and finished vehicles, of \$5,351,217.23. In the above items depreciation has been deducted from buildings and machinery.

#### HALLADAY ASSETS SOLD

Chicago, Jan. 15—All the personal property of the Streator Motor Car Co., of Streator, Ill., manufacturer of Halladay cars, was sold yesterday at auction to the Merchants' Realization Co., of Chicago. The price paid was \$56,000, which included all cars and those in the course of construction, together with the machinery contained in the plant. The sale, however, is to be confirmed by the court some time during the week of January 20, and in the event that the court should call the sale void the property will be re-auctioned immediately.

Although it was expected that the entire plant would be sold, including personal and real property, as yet no bids have been received for the latter, but it is expected that disposition of the real estate will be made of shortly.

#### R. C. H. CHANGES

Detroit, Mich., Jan. 13—At the annual meeting of the R. C. H. Corporation, J. F. Hartz, of Detroit, became president and treasurer of the concern, succeeding R. C. Hupp, who was elected vice president. C. P. Seider, formerly vice-president, now is secretary.

Besides the officers the new board of directors of the R. C. H. Corporation comprises G. W. Rogers and J. G. Robertson, Akron, O.; John Kelsey and Joseph H. Clark, Detroit; G. Jahn, New York, and C. C. McCutcheon, Jackson, Mich.

January 1, Peyton R. Janney, formerly of the General Motors staff, became general manager, retaining Fred R. Bump as assistant general manager.

#### STONE BIDS FOR PLANT

Indianapolis, Ind., Jan. 13—The Stone Car Corporation, organized in Indianapolis some time ago to manufacture a line of motor cars, has submitted a bid of \$100,000 for the plant of the T. B. Laycock Mfg. Co., which is in the hands of a receiver. It is understood, however, that the court will order the receiver to reject the bid, on the ground that it is too low. Fred I. Stone is president of the Stone company, which hopes to find a location soon so that active operations may be started.



# Day and Night Reliability Planned

CHICAGO, Jan. 13.—The Chicago Automobile Club, encouraged because of the success of the 1912 Elgin road races which it promoted in conjunction with the Elgin Automobile Road Race Association, has determined to venture into the promotion of other motor contests. Announcement was made today that the C. A. C. would stage one of the most novel reliability runs ever attempted—a non-motor stop, night-and-day trip from Chicago to Boston by way of New York city. This will be run the last week in June and it is figured that the trip can be made inside of 3 days.

As roughly outlined now, it will be a non-stock event run under grade 3 of the A. A. A. rules, but maybe a stock car division will be added if enough entries are forthcoming. There will be a change of drivers and observers both morning and night and it will be necessary to secure a special train to follow the tour to carry the relief crews and the officials. The rules will require that the motors be kept running continuously, even when taking on fuel and water, in order to escape penalization. It has been suggested that the entry fee be placed at \$200 which would give the entrant the choice of starting one, two or three cars.

Co-operation with other clubs along the route will be sought. The Bay State Automobile Association already has proffered its services and it is thought Buffalo, Cleveland, New York and other big cities will do likewise.

Dates selected for the reliability are June 25-28. The tentative schedule calls for controls at Toledo, Erie, Rochester, Albany, New York city and Boston. The distance is 1,276 miles and it is estimated that it will require 67 hours to make the journey. In addition to the main trophy certificates will be given for each non-motor stop performance.

## A. A. A. PLANS BIG TOURS

New York, Jan. 14—At a meeting today of the executive committee of the American Automobile Association two resolutions were read and approved from President Enos, who was too ill to attend, one recommending the appointment of a committee to take up with the National Association of Automobile Manufacturers the subject of a national reliability tour of commercial vehicles during the coming summer; the other to appoint a committee on the national reliability tour of passenger vehicles.

The outcome of the tour of commercial vehicles will largely depend on how the suggestion is received by the manufacturers. It is more than possible that the national passenger tour for this year will not be over the course laid out last season, from Detroit to New Orleans. At present

## Non-Motor Stop Run from Chicago to Boston Set for June 25-28

Minneapolis is bidding for the tour with the object of running from the Twin Cities to the Black Hills of Dakota and return. Dr. Dutton, president of the Minnesota State Association, is fathering the movement.

Ex-President Hooper was presented with a gold watch in appreciation of his services during his term of office.

Preston Belvin, of Richmond, Va., asked that the annual meeting of the association, which will take place at Richmond during the coming fall or winter, be held between November 1 and 15 instead of in December, as at present. The matter will be decided at the semi-annual meeting in Philadelphia in June. Mr. Belvin also moved for a consolidated tour at the time of the annual meeting, the tourists from all sections meeting in Richmond and spending the week there for the meeting.

## SAVANNAH SETS DATES

Savannah, Ga., Jan. 11—The grand prize and the Vanderbilt cup races will be held in Savannah on Thursday, November 27, and Tuesday, November 25, respectively. The grand prize will be pulled off on Thanksgiving day, while the Vanderbilt will be held 2 days earlier. The course will probably be shortened to 10 miles.

## EIGHTEEN IN FRENCH GRAND PRIX

Paris, Jan. 3—On the last day of the old year the entry list at ordinary fees closed for the French grand prix race to be run near Amiens early next July. The list contained eighteen cars, and unless manufacturers decide to pay double fees at the rate of \$1,600 per car, this number of competitors will start in the French classic. The competitors are, for France, three Peugeots, three Th. Schneiders, and two Delage; for England, four Sunbeams; for Germany, one Mathis and one Opel; for Italy, three rotary-valve Italas; for Belgium, one Excelsior. It is believed at the club that some firms will come into the race before the final closing on March 31, by paying double fees. Fiat, for instance has more than once come in at the last minute.

## BIG BANQUET IN BOSTON

Boston, Mass., Jan. 13—The annual banquet of the Massachusetts State Automobile Association was held last week at the Hotel Somerset in Boston and it was attended by more than 100 members from all parts of the state. President Lewis R. Speare presided and he had a number of prominent people as guests who all spoke about the importance of good roads. A.

G. Batchelder, chairman of the executive committee of the A. A. A., chairman G. A. Diehl of the A. A. A. good roads board; Chairman W. D. Sohler of the Massachusetts highway commission; Charles J. Glidden, the world-girdling motorist; John P. Coghlin of Worcester; President Hillman of the Springfield club; President E. A. Gilmore of the Bay State A. A. and Mayor Hatfield of Newton were the speakers.

## GALVESTON ANNOUNCES MEET

Galveston, Tex., Jan. 11—Plans for what already is assured of being the biggest motor race meet ever held in the south, with cash prizes totaling \$25,000, are well under way, under the leadership of Captain J. W. Munn, chairman of the beach course race committee of the fifth annual cotton carnival. The plans which have been set in motion are sanctioned by the Galveston Commercial Association.

The meet will be held in August during the cotton carnival days, tentatively set for August 7 to 16 inclusive, during the 10 days of which there will be 5 devoted almost exclusively to the motor races, the races being held every alternate day of the 10 as it is thought the best results and attendance can be secured in this manner.

According to present plans the races are all to be run over a course straightaway for 5 miles, turn and straightaway back for 5 miles, all entrants passing the long grandstands twice during each 10-mile lap covered. There are to be short races for the lighter cars, several races of 50 and 75 miles each for the larger cars, and races of 100 and 200 miles for the large cars and free-for-all events. In addition there will be a special prize of \$500 for lowering the beach record of 1 mile in 30.8 seconds, which is now held by Louis Disbrow, and there will be an additional special prize of \$1,000 for making a mile in less than 30 seconds. The 100 and 200-mile races will draw the larger part of the \$25,000 prizes, but there will be comparatively large prizes for the shorter races.

## BAY STATE A. A. ELECTION

Boston, Mass., Jan. 13—The annual meeting of the Bay State Automobile Association was held last week at the Hotel Lenox, Boston, and the following officers were elected: E. A. Gilmore, president; Harry Knights, vice-president; Josiah S. Hathaway, treasurer; C. P. Rockwell, secretary; F. A. Stidham, assistant secretary; Major Horace G. Kemp, Augustus Mr. Stevens were reelected, the latter re-B. Henley, Chase Langmaid, B. G. Ellis and W. H. Stevens, directors. All except Mr. Stevens were re-elected, the latter replacing M. H. Gulesian, who resigned.

# Engineers Listen to Interesting Reports

NEW YORK, Jan. 15—Special telegram—That a standard method of testing motor cars engines will shortly be adopted by the Society of Automobile Engineers is believed to be made certain by the tentative adoption of the report of the new division on motor testing which was presented by J. O. Heize to the standardization committee of the society today.

This new division on motor testing was created at last summer's meeting of the society. Since that time the division has gotten out tentative plans for standard testing apparatus to be used by factories and standard charts for plotting horsepower efficiency and economy curves. The division is endeavoring to develop tests of greatest practical value rather than striving for scientific accuracy.

## Motor Testing Report

The report of the standard motor testing arrangements will be submitted to the society as a whole at its regular meeting tomorrow. Several points will have to be decided as the society must determine whether the exact procedure and specifications of apparatus are types of dynamometers and if other instruments should be specified or left to the engineer in charge.

Sample curves and data sheets have been drawn up showing the suggested standard charts.

Another division to report was that of the aluminum and copper alloys which was read by William H. Barr. Two alloys were recommended by the division for addition to the list already standardized. These are two bronzes, the first of which is for light gears and the second a special gear noted for quiet running quality.

Chairman C. W. Spicer, of the broaches division, submitted a short report commenting particularly upon the hobbing of splined shafts and the machining of gears. Standard specifications for sheet metal and standards of sheet metal gauges was advocated by T. V. Buckwalter, chairman of the sheet metals division.

## Electric Lighting Report

Particularly interesting was the report of the division of electric lighting outfits by Chairman Palmer. The relative advantages of the grounded and ungrounded return circuits for lighting system were considered. It was brought out the grounded return provided a larger contact point and better installation of the lamp receptacles. "There are fewer connections at the switch that an ordinary system involving head, side and tail lamps has eleven connections with the grounded as against fourteen with the undergrounded system. As to the advantages of the undergrounded return, all hinge on the fact that accidental ground on the battery side of a grounded return system short-circuits the battery, whereas in the underground system it would be necessary to ground

## S. A. E. Talks Over Findings of Various Standards Committees

both sides of the circuit. No definite recommendation was made as to grounded return. The report recommended that standard electric light bulbs be known as 7-volt bulbs and have an efficiency of 1.1 watts per candle at voltages between 6.5 and 7.

Standard electric headlights are to be 2.1-16 inches diameter size and capable of being focussed in a reflector of  $\frac{7}{8}$  inches or greater focal length. An effort is being made to get data from battery makers from which to specify standard dimensions of batteries and plates, giving three standard plate sizes from which batteries of any capacity can be made by simply increasing the overall length of the battery.

Chairman Riker, of the miscellaneous division mentioned work on method of designing gear ratios. His report dealt chiefly with yoke and rod-end sections.

Action is being taken toward standardization of the terms used in the industry, but the nomenclature division has not reached the point where definite report should be made.

## Chairman Kennedy's Findings

The work of the truck standard division was gone over by the chairman, W. P. Kennedy. It was the sense of his division that although unprepared to present definite standards on any parts as yet the division should proceed slowly to fix a number of the more important points, such as the size of motors in relation to load capacity and tire sizes for different loads and capacities and different dispositions of the load on the body. Mr. Kennedy also is chairman of the wheel dimensions and fastenings for tire division of the society.

This is the fourth report of this division which was characterized by Henry Souther, chairman of the standard committee, as the masterpiece of the society. Specifications for a standard motor truck wheel were recommended and these produce a great deal of discussion on account of the close limits of tolerance specified and the requirements of a certain amount of machine work. This report, with the new stringent specifications, were referred to the society as a whole and will be acted upon tomorrow, where it is promised there will be some very lively discussions among rim wheel and tire makers.

The use of low grade fuel for motor trucks was discussed by N. B. Polk, who considered a different type of fuel, such as kerosene, distillate and naphtha, as substitutes for gasoline and suggested the requirements of carbureter for the purpose and also gave some hints on overcoming the difficulties of hard starting. Mr. Polk's paper precipitated a lively discussion on engine fuels, in particular the change in the

grade of gasoline during the past few years. As an outcome it is probable that a committee will be appointed to seriously consider the gasoline problem toward designing for future grades of fuel.

Chairman Souther took up the international strife existing in the United Rim Association and pointed out that this organization is soon to be disrupted, so that the market will be flooded with many types of rims.

There are at present about five types of quick-detachables and as many demountables. With this situation in view, it is now the psychological moment for the society to step in and standardize this product. Accordingly he proposed the formation of a committee to deal with the subject which would be so constituted as to be unbiased in its views. It was finally voted by the standards committee to recommend to the council the widening of the scope of the recently formed wire wheels division, so as to deal with the situation. It was suggested that the name of this division be changed from wire wheels to pleasure wheel division.

## COLUMBUS STREET CAR LAW INVALID

Columbus, O., Jan. 11—The Columbus Automobile Club, of Columbus, Ohio, has succeeded in having Judge Kinkead in the court of common pleas declare the recently enacted ordinance, compelling all motor car drivers to come to a full stop while passing a street car discharging or taking on passengers, unconstitutional.

Attorney Saviers, who represented the club in the test case, argued that a person boarding or alighting from a street car was not a passenger until he was fully on the car and thus the wording of the ordinance was ambiguous. He also contended that the ordinance tended to congest traffic at street crossings.

The city will not carry the case up to a higher court.

## ENGLAND LEADS IN CARS OWNED

Paris, Jan. 10—England appears to have definitely secured the lead among European countries in the matter of the number of private motor cars. The official returns for the year 1912 show that there were 90,953 privately-owned cars in Great Britain, 76,771 in France, and 44,467 in Germany. These figures do not include vehicles used for commercial purposes, nor motor cycles or the various types of three-wheelers. So far as France is concerned, they also exclude all cars owned by manufacturers and agents and running under trade numbers. For the last 6 years the returns are as follows:

Year	England	France	Germany	Total
1907.....	32,451	31,286	10,091	73,828
1908.....	40,902	37,473	14,797	93,172
1909.....	48,019	44,769	18,744	111,532
1910.....	53,169	53,659	22,371	129,199
1911.....	73,617	64,269	33,378	171,264
1912.....	90,953	76,771	44,467	212,191



# Milwaukee and Montreal Hold Shows

**MILWAUKEE, Wis., Jan. 13**—The most striking feature of the fifth annual Milwaukee motor show, which opened in the Auditorium on Saturday evening, January 11 and closes Friday evening, January 17, is that for the first time since motor expositions were started in Milwaukee, every local dealer is represented by an exhibit.

There are represented in the show seventy-one distinct makes of pleasure cars, with an aggregate of 169 models on display; seven makes of electric cars, with twenty-three models on display; fourteen distinct makes of commercial vehicles, with forty-seven models on display, and twenty-seven distributors of supplies, accessories and parts, representing more than 500 factories producing such goods.

It is worthy of note that in addition to exhibits from every dealer in Milwaukee, outside factory representatives, factories or large distributors whose cars are not represented in Milwaukee by direct agents, are showing products. Among these are the Peerless, Cole, Pathfinder and Enger. Cars which gained representation in Milwaukee since the last show in January, 1912, and now in the Milwaukee show for the first time include: Cartecar, Staver, Little, Chevrolet, Marathon, McFarlan, Stanley, Pullman, Nyberg, Davis Flyer, Metz, Premier, Stevens-Duryea and Velie.

The great interest aroused by the show may be seen from the fact that the principal conventions bearing on the industry are held during the show week, and directly at the show, for the Auditorium is so constituted that it is possible to hold a dozen conventions at one and the same time, one not interfering with the other. Thus there are meetings during the week the Wisconsin Retail Automobile Dealers' Association; the Wisconsin Association of State Agents, the Wisconsin State Automobile Association, the organization of owners; the Wisconsin Commercial Car Association, the Wisconsin Accessories Association, and a half dozen lesser organizations which have to do with the sale and use of motor cars, parts, etc. The 1913 Milwaukee show is conducted by the Milwaukee Motor Show Association, a union of all dealers. An elaborate decorative scheme has been provided for the 1913 show which eclipses anything previously attempted.

## QUAKERS READY FOR SHOW

**Philadelphia, Pa., Jan. 11**—Only the finishing touches remain to be added before the opening of the twelfth annual Philadelphia show in the mammoth new building of the Automobile Club of Philadelphia, Saturday night under the auspices of the Philadelphia Automobile Trade Association. Applications for exhibition space are still coming into the

## Minor Circuit Exhibitions Are Successful—Quakers Getting Ready

show committee, assuring a number and variety of exhibits that will totally eclipse any former record, about seventy companies being so far represented, exclusive of the accessories dealers.

In addition to the show to be held in the new building of the Automobile Club of Philadelphia, the Philadelphia Automobile Board of Trade, Incorporated, will conduct an exhibition in the First Regiment armory, at which novelties in the form of foreign models entirely new to Philadelphians will be shown side by side with several representative American cars. It is planned to transplant the Importers' Salon New York exhibit here, consisting of thirty-two models representing ten different foreign makes. Entries of cars for the American section so far received number fourteen different makes, affording opportunity for comparison at close range.

## MONTREAL HOLDING SHOW

**Montreal, Que., Jan. 13**—The seventh Montreal show, under the auspices of the Automobile and Aero Club of Canada, opened last Monday and closed Saturday night. It was larger than ever before. In addition to the Drill Hall, an overflow show was held in the Sixty-fifth armory.

The show closed on Saturday night. In point of the number of exhibits, the attendance and the business done it showed a great advance over those of previous years. It is estimated that about 40,000 people attended, and the actual sales reported by dealers amount to \$300,000.

The show has developed the fact that the dawn of a new prosperity has risen over Canada. Bumper crops have come from the fields. The farmers' bins are bulging. The railroads are buying. Mills and factories are running full blast. And on the crest of this prosperity wave the motor car has been washed in. And the evidence of it is to be found right here in Montreal.

Montreal is a city of high-class cars. The heavy gradients of many of the streets, and their poor surface, have eliminated the initially cheap vehicle. Owners in Montreal early discovered that the car which pays the best in the end is the one whose qualities can stand the most severe testing.

A census taken of owners in the city shows the initial cost of all motor cars to have been \$5,791,194, or an average price of \$2,562. Of these 286 were of an average price of \$6,485, 176 of an average price of \$3,439, and 687 of \$1,433. Eighty-three different makes are reported.

Forty-eight per cent were manufactured in the United States, 45 per cent in Canada, 4 per cent in France and 3 per cent in Great Britain.

Poor as is the condition of Montreal streets, generally, local dealers state that it is not so bad, so far as motoring is concerned, as a number of other Canadian cities. Around Winnipeg, for instance, it is pointed out, the soft nature of the roads is particularly trying on cars.

A branch of motor traction of which great developments are expected in Montreal, is that of the motor truck. On October 31, 1912, the number of motor driven commercial vehicles in Montreal was 114, twenty of them being operated by the large departmental stores. Since that date, many more have been disposed of by local dealers, and they predict large sales in the near future.

## FAILURE IN BOSTON

**Boston, Mass., Jan. 11**—J. S. Harrington & Co., who have the New England agency for the Flanders cars, made an assignment yesterday for the benefit of their creditors. The company started with headquarters in Worcester, then took salesroom in Providence and later moved to Boston. The liabilities aggregate \$50,225 of which \$119 is for wages, \$2,000 is secured and \$48,106 unsecured. Of this amount the Flanders Motor Co., of Detroit, is owed \$16,000; the Mechanic's National Bank, Worcester, \$10,000 for a note; William A. Carpenter and Albert H. Inman, both of Worcester, \$1,575 and \$3,000 for salary and money advanced. The assets are estimated at \$39,113. Individually John S. Harrington owes \$24,204 to four unsecured creditors and Daniel A. Harrington, Jr., \$15,100, the principal one being Elizabeth M. Orndorff of Providence who advanced \$15,100 to each one, a total of \$30,200. There is some talk of the agency being turned into a branch.

## CONCESSION TO CHICAGO DEALERS

**Chicago, Jan. 13**—Through the efforts of the Chicago Automobile Trade Association the Lake Shore and Michigan Southern Railroad has erected a motor car receiving station at Twenty-third street and Armour avenue, the platform being 320 feet in length and 30 feet in width, 10 feet of which is fully inclosed. This station avoids the necessity of the freight being received in the down town district, while time is saved by its being within a few minutes drive of the heart of motor row.

## KEETON BUYS A PLANT

**Detroit, Mich., Jan. 13**—The property at Breckenridge street, Lawton avenue and the Michigan Central tracks, formerly occupied by the Oliver Motor Truck Co., has been purchased by the Keeton Motor Car Co. at a purchase price of \$50,000. Active manufacturing will start Jan. 17.

# Advancement in the Ignition Field

FOR 1913 the most important change made by the manufacturers of sparking devices for motor cars has been centered about the control. Automatic and governed control of the magneto have been given more consideration than any other improvements in this direction.

Many reasons have been set forth by the manufacturers for confining their efforts almost entirely to the perfection of spark control, by far the most plausible being that the human hand is not sensitive enough to respond to the innumerable speed variations of a gasoline motor. In the automatic spark control any increase in motor speed is accompanied by an advance in spark occurrence and any decrease in motor speed by a retard of the spark.

## Trend in Spark Controls

On the other hand, governed control acting almost under the same conditions, advances the spark with an increase in motor speed up to a certain point. It has been deemed advisable to advance the spark, but not beyond a given point, the latter varying with the different types of motors. Although the automatic and governed spark control relieves the operator of the motor vehicle of certain duties, nevertheless manufacturers are thinking seriously of going a step farther. Experiment in the matter of a fixed spark is making rapid progress. In this form of control the spark occurs at a certain point in the cycle and does not change with motor speed. That is, if the spark is

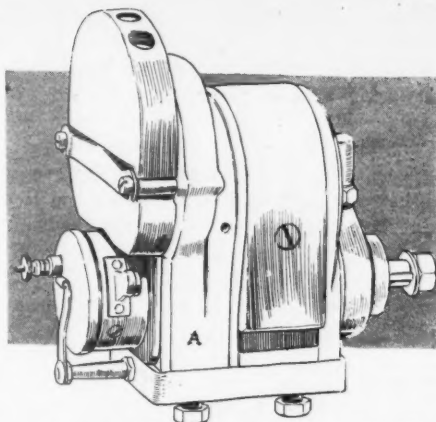


FIG. 1—HERZ R-4 WITH ALUMINUM CASE, A

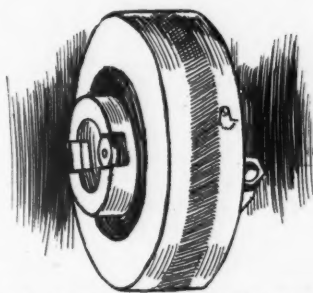


FIG. 2—HERZ TIMING ATTACHMENT

set or fixed at  $\frac{3}{8}$ -inch before top dead center it always will occur at that point regardless of the motor's speed.

Foreign makers already have formed opinions regarding this matter and the majority are in favor of the fixed spark.

The American manufacturers expect to limit this to motors of small piston displacement, for evidently they believe that it is not advisable to fix the spark on large motors. The fixed spark is a rare thing on the 1913 pleasure car motors but has made a marked advance in the commercial field.

Making the magneto waterproof and dirt-proof has been given much attention and in most instances where this has been looked after the entire mechanism has been inclosed.

A great deal of activity is shown in the desire of the manufacturers to make electric cranking and lighting systems, and nearly all magneto concerns either have announced, or are about to announce, combination sets. The majority of makers are showing devices to be used in connection with electric cranking and lighting arrangements.

The compound armature type of magneto is gaining in favor. In this type of magneto both primary and secondary windings are on the armature shaft, thus doing away with an outside coil. However, in the dual system the dash coil is necessary for raising the voltage of the battery current. The coils are being placed on the motor side of the dash.

In most instances if no structural changes were made in the magnetos, the finish or material has been improved. Both alternating and direct current machines will be found on market for 1913. The makers of the direct-

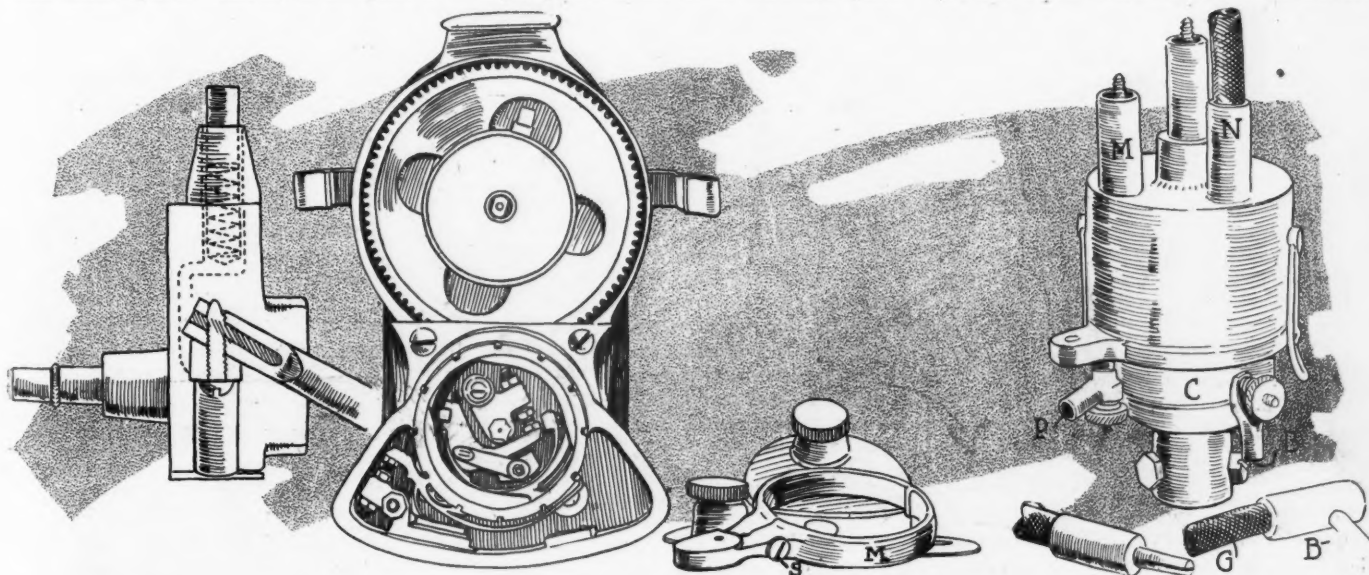


FIG. 3—SECTION OF BOSCH CABLE FIG. 4—BOSCH DUAL ZR-4 AND TIMING ARM FIG. 5—CONNECTICUT IGNITER



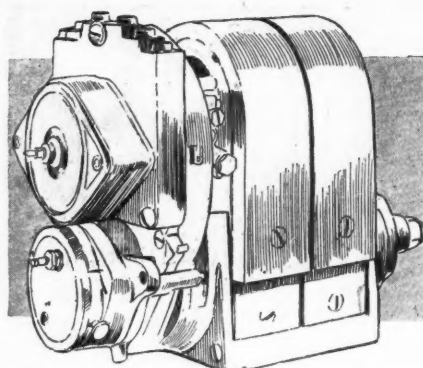


FIG. 6—EISEMANN EUR FOR SIX CYLINDERS

current type are able to give an attachment so that the current may be used for charging the batteries, but in the case of the alternating current magnetos, the addition of a commutator is necessary in order to first transform the alternating current to direct.

**Bosch**—No radical changes are to be noted in the products of the Bosch company. However, the variable timing lever arm is worthy of note, as well as the methods adopted for making the instrument proof against water and dirt. The dismantled lever arm parts are shown in Fig. 4. The arm no longer is integral with the lever. Thus, if the position of the advance is to be changed, the screws of the lever arm, M, are loosened and the arm shifted to the desired position and the screws then tightened. The spark gap has been encased and the magneto entirely inclosed. All joints have been made dust and water-proof. By a decidedly clever arrangement, the Model ZR may be timed without removing a part. A window, W, in Fig. 11 on the distributor board cover is used to tell the position of the distributor arm. The figure 1 appears at the window which indicates that the distributor arm is making contact with segment number 1. There are no other numbers making it necessary to use No. 1 cylinder when timing. There is another window,

W2, at the top of the magneto as shown in Fig. 10. This is to tell the position of the breaker points. When a mark on a tooth of the gear is in line with a similar mark on the window the breaker points are beginning to separate. Thus, in order to set the magneto in position the window is watched until figure 1 appears. No. 1 piston is then put in its proper position. The magneto shaft is turned until the breaker points are beginning to separate, and then slipped into position. Fig. 11 also shows the lever arm, M, in position.

The distributor cover on all Bosch magnetos is held in place by means of two flat springs, F. These are shown in Fig. 10. The ZR series was designed to give an efficient spark at cranking speed; in other words, the manufacturers claim that the battery is not entirely necessary, but that a swift turn of the crank will cause

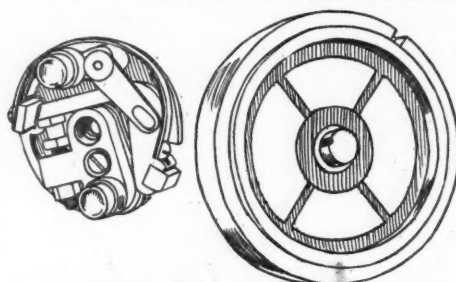


FIG. 8—BREAKER AND COMMUTATOR ON SIMMS

a sufficient spark to start the engine. The oil wells are protected from the entrance of dirt by means of dust covers, C. Fig. 10 shows the location of the oil wells. O.

**Splitdorf**—Four new magnetos constitute the additions to the Splitdorf line for 1913, two of these being of the three magnet type for large four and six-cylinder engines and the other two are of the two-pair magnet type and intended for smaller four and six-cylinder motors. The former will be known as models W and Z respectively, and the latter X and Y.

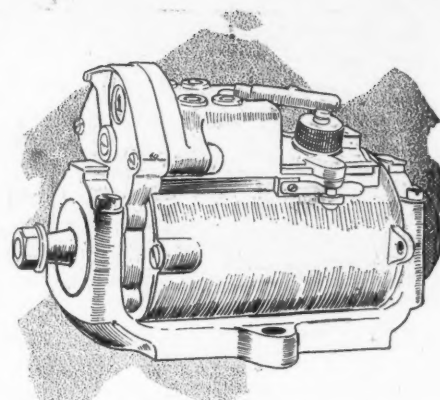


FIG. 7—MEA BH-4

Instead of placing the armature connection at the breaker-box end it has found its way to the back plate of the magneto. To insure better wiping of the armature the two carbon contact brushes have been replaced by one large brush. Fig. 26 is an illustration of the new model X and Fig. 20 model W. Detailed refinements have been raised to a high standard of efficiency.

A new vibrating coil has been added to the Splitdorf line. This is known as the model TS and is notable in that it is equally effective with all the newer as well as the older models of Splitdorf magnetos. It is inclosed in a tight water-proof case extending through the dash.

Two new Splitdorf products are the Splitdorflite lighting generator and the Splitdorflite combination lighting and ignition magneto. Both of these will be described in connection with the lighting systems in an early issue.

**Remy**—The feature of the Remy line for 1913 is the new model RL shown in Fig. 14. It has a stationary winding, thus doing away with moving contacts. A single winding of coarse wire is held rigidly between the pole pieces, to which permanent magnets are fitted. The steel inductor shaft is the only revolving part, and this shaft is shown in Fig. 14. The

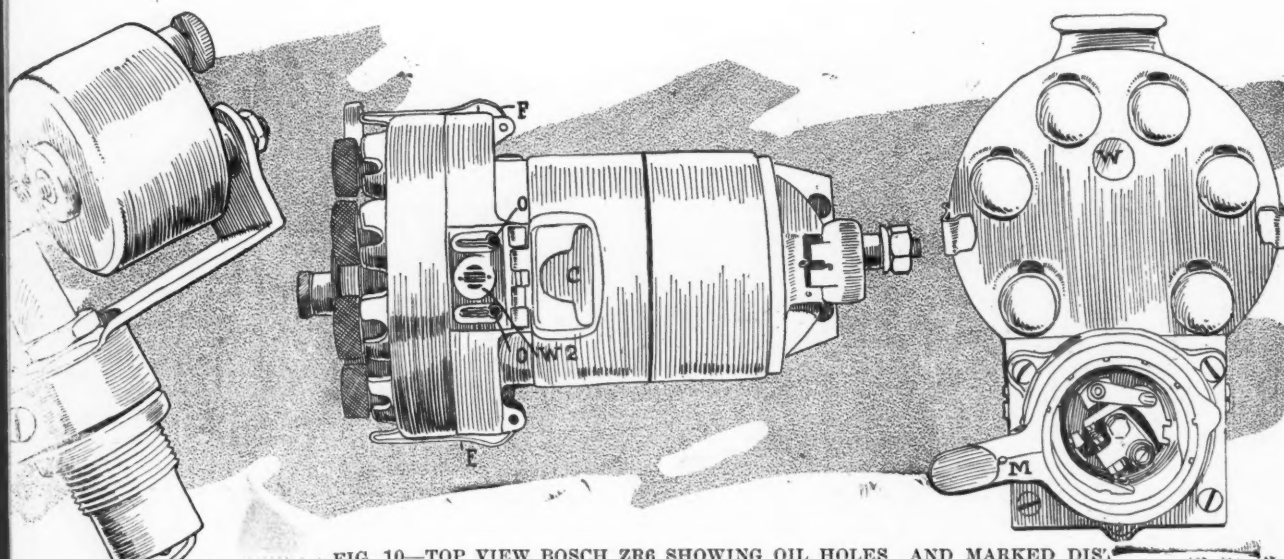


FIG. 10—TOP VIEW BOSCH ZR6 SHOWING OIL HOLES AND MARKED DIS.

FIG. 9—HI-FRE-CO RESONATOR

FIG. 11—INTERRUPTER AND TIMING ARM BOSCH ZR6

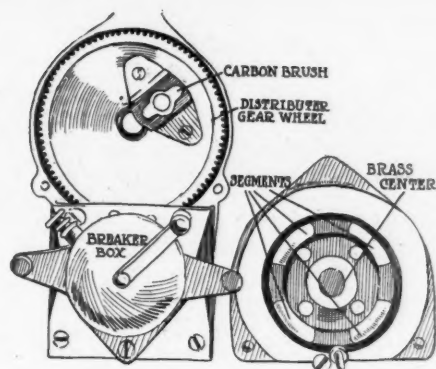


FIG. 12—SIMMS WITH DISTRIBUTOR COVER REMOVED

shaft has keyed to it by means of Woodruff keys the coupling and inductors. The latter are balanced to eliminate as far as possible undue strain on the magneto bearings. In the magneto itself is a small condenser, which is used to prevent sparking at the breaker points.

Timing has been facilitated by an ingenious method. A small push button is provided at the top of the distributor and there is a recess in the distributor gear, so that by pushing the button a plunger drops into the recess, thus locating a segment opposite a marked terminal on the distributor cover. Making the magneto waterproof has been accomplished by using Bakelite as the material for the distributor. This substance is unacted upon by water and acids and is not brittle. A lighting system is being introduced by the Remy company for 1913.

**Briggs**—No changes have been made in the Briggs line for 1913, in so far as construction is concerned, but the finish of the magnetos has been given greater consideration. Besides the standard high-tension models, one of which, the C-4, is shown in Fig. 28, the Briggs products for 1913 include a combination ignition and lighting device and another lighting and starting outfit. The H coil manufactured by this company is mounted on the motor side of the dash with only the switch appearing on the body side.

**Eisemann**—An automatic spark advance continues to be the feature of the Eisemann magnetos. Fig. 18, illustrating the armature with the automatic advance,

shows the armature winding A, the condensed. D, and the driving shafts, the governor weights, W, swing away from the shaft and the greater the distance from the shaft the farther the spark is advanced. Upon the speed of the shaft depends the outward swing of the weights. The figure also shows the collector ring, C, the driving pinion, V, and the breaker mechanism, M. Model EB is illustrated in Fig. 22, together with the breaker mechanism. The type EUR in Fig. 6 shows the overlapping magnets, a desirable feature on modern magnetos.

The pole shoe, although not an entirely new device, does not require that the armature shaft revolve at high speed before an ignition spark occurs. At sixty-five revolutions per minute the magneto will give a spark sufficient to ignite any incoming gas as against 120 revolutions when the old type of pole shoe was used. The newer type is made to concentrate the magnetic lines of force toward the center of the armature winding.

The Eisemann high-tension magnetos are of the true high-tension type, that

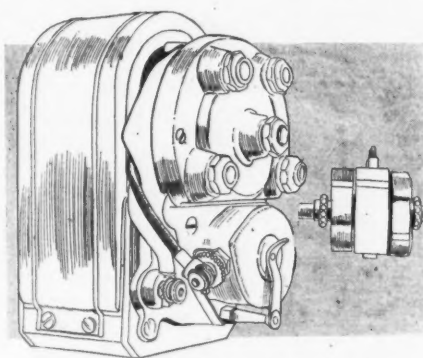


FIG. 14—REMY RL AND ROTOR

is, both the primary and secondary windings are on the armature shaft. This eliminates the dash coil, but in the case of the dual system a dash coil is necessary to stop up the battery current.

**Herz**—Making the housing of aluminum is a feature of the 1913 Herz magneto shown in Fig. 1. The overlapping magnets is another interesting feature. The automatic timing adjustment brought out last year still continues to be attractive. An illustration of the device is

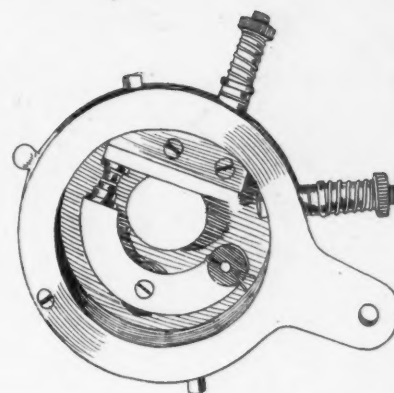


FIG. 13—BREAKER BOX OF CONNECTICUT IGNITER

shown in Fig. 2. It is made in two parts, each part containing six curved grooves and between the two parts of the apparatus are six balls. This makes the apparatus operate like the ball governor used for automatic control, but in this case the balls are inclosed and free, whereas in the other type the balls are not usually inclosed, but resemble the ball governor of the old type of steam engine.

**Simms**—Improvements are to be noted on the Simms SU series for the coming year. Timing is facilitated by the use of a window in the distributor cover. When No. 1 appears at the window the distributor arm is making contact with the segment corresponding to cylinder No. 1. The SU type is shown in Fig. 12, and the manufacturer offers this type in the independent and dual systems. This series also is offered in fixed spark, thus the choice given adds to the features of the line. The timing lever is furnished with an arm on each side. This arrangement permits of the coupling of the spark control mechanism, easily. In Fig. 12 the distributor cover is removed and the cover of the breaker-box also.

The new Simms commutator, Fig. 8, consists of a special heat-treated insulating material into which four bronze segments are moulded. Two of these segments are connected with the terminals of the commutator while the others serve as a path for the contact breaker brushes. By making the commutator face of the same material even wear is assured.

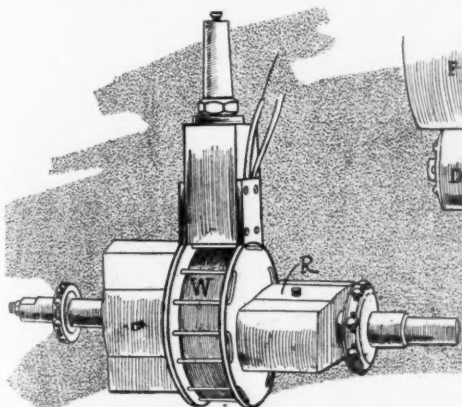


FIG. 15—K-W ARMATURE SHAFT AND WINDING

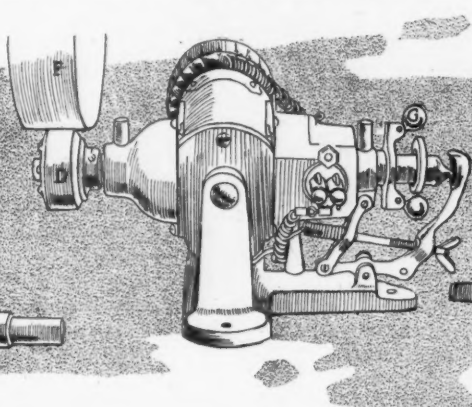


FIG. 16—BALL GOVERNED MOTSINGER

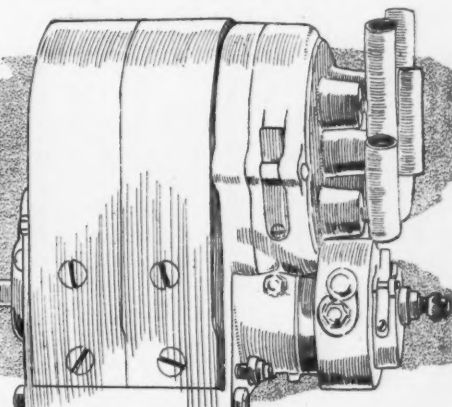


FIG. 17—KINGSTON HIGH TENSION



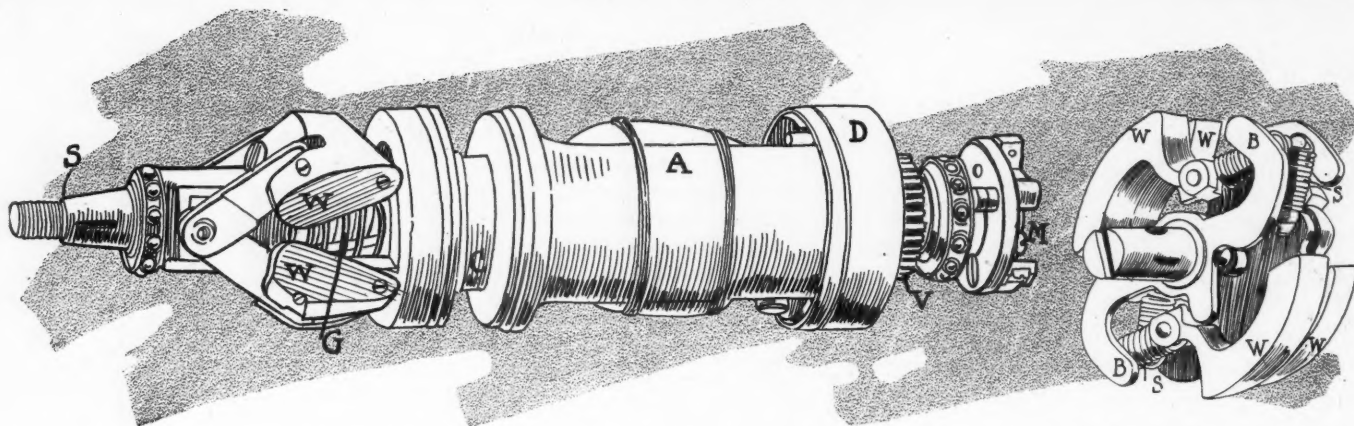


FIG. 18—DETAILS OF AUTOMATIC SPARK CONTROL ARMATURE ON EISEMANN

The new commutator is shown in Fig. 8, together with the contact breaker mechanism.

**Connecticut**—The only addition to the products of the Connecticut company is the igniter shown in Fig. 5. This is simply a transformer in which the current from a battery is led to a coil through P in the figure. The interrupter mechanism is within the case, C, and is shown separately in Fig. 13. The battery current is stepped up in voltage by means of a secondary coil. The ground cable is shown in Fig. 5, as G. The prong, B1, fits into the ground terminal B. The leads to the spark plugs are lettered M and N. The igniter may be taken apart without the aid of mechanical tools.

The plug coil is a feature of the line and, as the name implies, is a spark plug and coil combined.

**Atwater Kent**—Type K, Fig. 25, is the new product of this company. The system is of the transformer type raising a low voltage from a battery to a higher voltage and distributes it to the various plugs. The automatic spark control is a feature of the 1913 Atwater Kent ignition system. An illustration of the apparatus which controls the spark is shown in Fig. 19. It is based on the principles of the ball governor, but instead of using balls the flat weights, W, are used. When the shaft revolves the weights tend to swing outward and to prevent this from being done too rapidly the weights are made to act against the springs, S. The farther the weights move from the shaft the more the spark is advanced.

The faster the shaft revolves the farther outward the weights move and hence the greater the advance of the spark. In the illustration the brackets, B, are indirectly connected to the spark lever.

**Mea**—For the first time in the history of Mea magnetos there appears this year a model which does not involve the distinctive Mea feature of the rocking field magnets. This new model is the waterproof design just brought out, shown in Fig. 7. The waterproof feature is obtained by entirely covering the whole upper part of the instrument in a metal housing. The joints are fitted so that there is no possibility of water entering

the housing to reach the magneto armature or the contacts. The only portions protruding from the case are the driving gear, the terminals and the arm by which the magneto armature is revolved within the fields to advance or retard the spark.

Protection of the high-tension terminals is afforded by the insulating terminal plate in which the holes for the leads to the spark plugs are drilled at an angle.

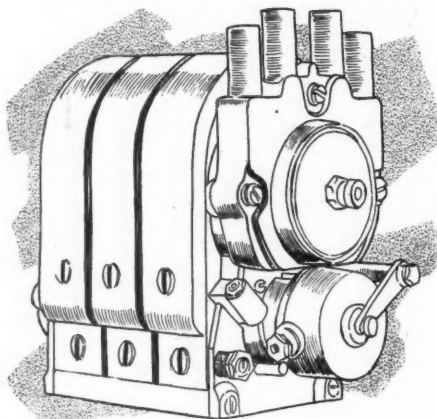


FIG. 20—SPLITDORF MODEL W

Vertical holes in the top of the terminal plate take the connecting studs whose heads are beveled to close the holes.

As mentioned, this new waterproof model is not arranged for rocking the fields as in other Mea instruments, for spark advance. But the armature is rocked on its shaft instead. This accom-

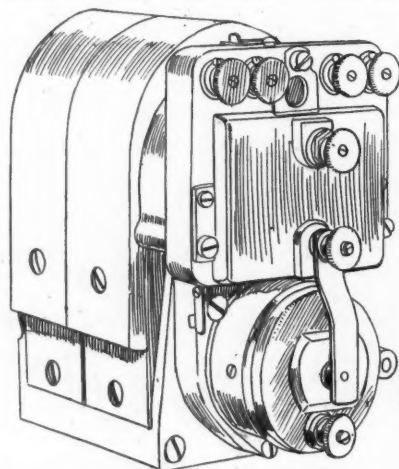


FIG. 21—HI-FRE-CO HIGH TENSION

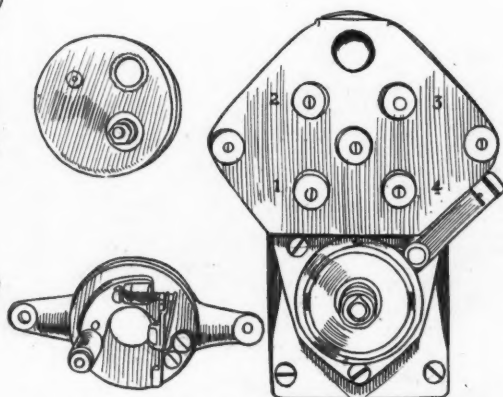


FIG. 22—EISEMANN SHOWING BREAKER BOX

plishes the same results and permits of the inclosed characteristic of this model.

The feature of most interest in Mea magnetos in general is its bell-shaped magnet, placed horizontally so that it can be shifted around the armature. The magnet is suspended on its axis so the weight of the magnet is balanced in any position of timing. The shape of the magnet is such that practically all of the magnetic field is occupied by the armature, inducing the greatest current and the hottest spark. This results in an igniting spark at comparatively low speeds.

**Hi-Fre-Co**—The Hi-Fre-Co ignition system, made by Dean Electric Company, consists of: First, a plain magneto, Fig. 21, with wires extending from the distributor to the resonators, which are attached to the plugs, shown in Fig. 9; second, a dual system in which a combined dash coil and switch is employed so that battery current can be used as a second source of electrical energy in place of the magneto current; third, a plain battery system in which a combination interrupter and distributor, together with a combined dash coil and switch, constitute the working elements. In all of these systems, the ignition spark is of a very high frequency, between 500,000 and 1,000,000 oscillation per second. This high frequency is obtained by the discharging of a very small condenser, which receives its charging current from the magneto armature or the battery coil, as the case may be. This

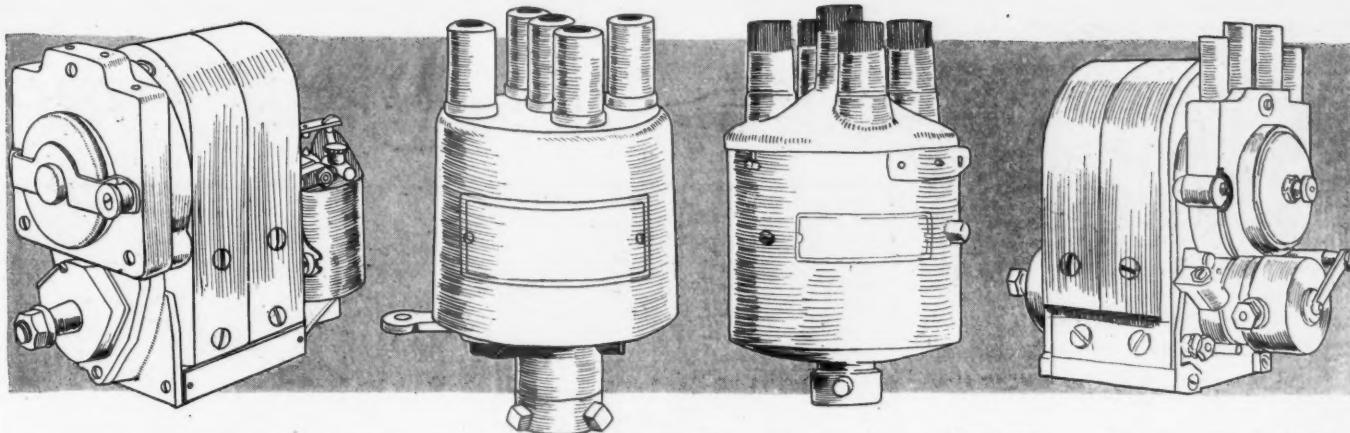


FIG. 23—WESTERN ELECTRIC PITTSFIELD TYPE F

FIG. 24—RHOADS UNIT SPARK SYSTEM

FIG. 25—TYPE K ATWATER KENT

FIG. 26—SPLITDORF MODEL X

condenser discharge is distributed through a low-tension distributing device and carried directly to small transformers, which are placed adjacent to the spark plugs and are called resonators. These resonators step-up the voltage directly at the point of application, so as to avoid all losses of energy in the wiring and make it unnecessary to provide high insulation throughout the system.

**Kingston**—The placing of the condenser within the magneto is the principal change on the Kingston model B high-tension magneto. The condenser in previous models was placed in the coil box on the dash, but the coil this year is of the tubular type and is placed behind the dash. The entire magneto is covered thus making for a waterproof device. The Kingston is shown in Fig. 17. Besides the model B the manufacturer of Kingston apparatus makes a varied assortment of magnetos of the make-and-break type for use on stationary engines and on motor boats.

**Western Electric-Pittsfield**—This company, formerly the Pittsfield Spark Coil Co., has for its feature this year a new dual ignition system, involving the Western Electric Pittsfield high-tension magneto and the removable unit spark coils for the battery side.

The magnetic field contains four poles, two of which are the poles of the magnets and two additional coil fields. The high-tension current is generated in the magneto coil which is at the rear of the instrument shown in Fig. 23. The type N is the dual magneto of this line and both ends of the primary circuit are insulated instead of one, as is customary.

**Rhodes**—This is of the transformer type of ignition system and as is seen by the illustration in Fig. 24, is somewhat resembles the Atwater Kent sparker. The Rhodes is marketed by the New York Coil Co. The makers claim that sparking at the breaker points is eliminated by the use of a condenser which is part of the instrument.

**Michigan**—Fig. 27 shows the 1913 Michigan magneto model and sees no changes except in the finish and materials. The latter have been made more substantial, especially the permanent magnets which the manufacturers claim contain a high percentage of tungsten, a metal that increases the magnetic qualities of the ordinary magnet. The Michigan line for 1913 also includes the model C intended for six-cylinder motors.

**K-W**—Reducing the number of revolving parts has been the aim of manufacturers of the K-W magneto and this

has been accomplished to a great extent. The rotor, R, shown in Fig. 15, is the only part of the magneto that revolves. This rotor is constructed of lamination of soft sheet iron which are riveted together. The winding, W, which is concentric with the armature shaft is set between the two parts of the rotor as shown in Fig. ... Both primary and secondary windings are included in the unit. The windings are insulated with paper over which has been poured a molten insulating compound. This hardens in the pores of the paper in a short time. The models H and J are the high-tension instruments made by this company for use on motor cars while the rest of the line includes magnetos of the low-tension types and those of the make-and-break class. The model LS may be used for lighting as well as ignition.

**Motsinger**—One of the products of this company is known as the auto sparker and is friction-driven dynamo. The instrument is made to furnish current for a motor of any number of cylinders. The armature shaft has at its end a disk, D, which presses against the flywheel, F, in Fig. 16. The spark is governed by means of a ball governor, G. When the shaft is revolving at great speed and the balls spread thus separating the friction surface from the flywheel and consequently discontinues supplying current until the engine slows down.

**Heinz**—Using a round horseshoe type of magnet is the characteristic feature of the Heinz magneto, while an added feature is that both ends of the primary winding are grounded instead of one as heretofore. The high-tension Heinz magneto is of the compound armature type and as in other cases does not require an outside coil.

**U & H**—This make of magneto is of the compound armature type and is designed for single ignition. The 1913 products see changes in detail refinements and finish as well as in materials.

**National**—The feature of the National magnetos is the low-tension distributor with a separate coil for each cylinder. These coils are mounted near the spark plugs, so that the high-tension wiring is as short as possible. The coils are about one-fourth as large as the standard dash coil.

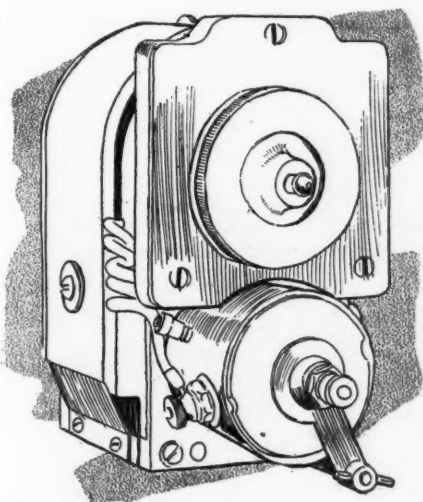


FIG. 27—HIGH TENSION MICHIGAN

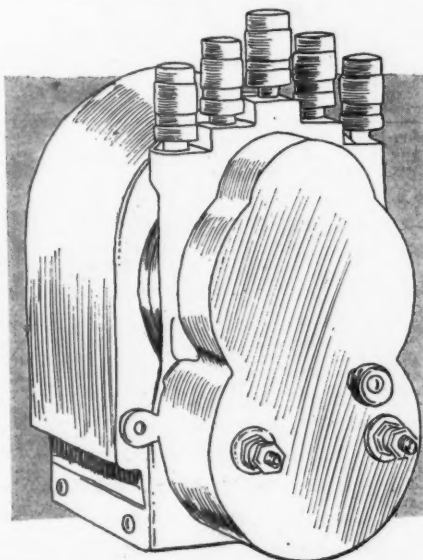


FIG. 28—BRIGGS MAGNETO





# Routes and

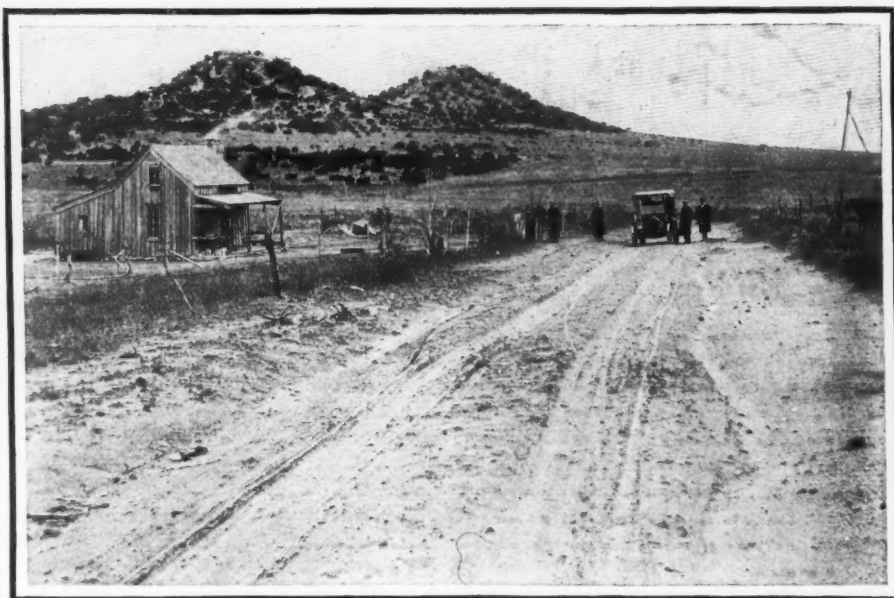
## EMPORIA TO PHOENIX, ARIZ.

**H**AMILTON, Kans.—Editor Motor Age—I am contemplating a trip from Emporia, Kans., to Phoenix, Ariz., and am undecided as to what road to take.—C. F. Ott.

The Santa Fe trail is your route west as far as Dodge City, the towns being Saffordville, Cottonwood Falls, Elmdale, Clements, Florence, Peabody, Newton, Halstead, Burrton, Hutchinson, Nickerson, Sterling, Lyons, Chase, Ellinwood, Great Bend, Kinsley, Offerle, Spearville and Wright. To Hutchinson it is 122 miles and to Dodge City 155.

You now follow the Borderland trail which runs in a southwesterly direction through Kansas, Oklahoma, Texas and New Mexico.

A very useful two-page article on this trail with map from Dodge City to Phoenix appeared in the issue of December 5. You will find it about 890 miles to El Paso, Tex., over this road and it is really the best in that section of the country. The towns are: Reinert, Fowler, Plains, Springfield, Edmund, Liberal; in Oklahoma go through Tyrone, Hooker, Guymon, Goodwell, Texhoma; in Texas the routing is Stratford, Ruby, Dumas, Amarillo, Canyon, Happy, Tulia, Kress, Plainview, Hale Center, Abernathy, Lubbock, Brownfield, Gomez, Plains, Bronco; then New Mexico with some bad roads in several places going through Roswell, Picacho, Hondo, Ruidoso, Mescalero, Tularosa, Almagordo and entering El Paso through Fort Bliss.



TWO OF THE SEVEN KNOBS BETWEEN GLENROSE AND MERIDIAN, TEXAS

Going west across New Mexico the towns are Anthony, Mesquite, Afton, Aden, Cambray, Deming, Lordsburg, and Rodeo; and in Arizona through Douglas, Lowell, Hereford, Huachuca, Vail, Tucson, Red Rock, Florence, Mesa and Phoenix.

For running directions the Blue Book, volume 5, can be used except for the Borderland trail and for the road from Lordsburg to Tucson.

## LAREDO TO SAN ANTONIO

McAllen, Tex.—Editor Motor Age—Please route me from Laredo, Tex., to San Diego, Cal. Four of us want to make the trip some time before February, and wonder if it can be done. What is the distance of the trip, and can we drive all

the way or will we have to ship in any place?—J. M. Naron.

It is very doubtful if you can find a feasible direct road along the western border of Texas to El Paso. Motor Age would suggest that you go to San Antonio following the I. and G. N. tracks to Pearsall, diverging to Hondo, Castroville to San Antonio. This is done because of the sand between Pearsall and San Antonio along the railroad. The route is fairly good and an average of 25 miles per hour can be made on it. The itinerary is Cactus, 30 miles; Encinal, 9.7 miles; Cotulla, 29.3 miles; Dilley, 16.9 miles; Frio river, 5 miles; Pearsall, 11.2 miles; Hondo, 35.1 miles; Castroville, 16.9 miles; San

## Climatological Guide and Attractions of Southern States for Motor Tourists Who

	Jacksonville, Fla.	Tampa, FLA.	Savannah, Ga.	Atlanta, Ga.	Mobile, Ala.	Gadsden, Ala.	Jackson, Miss.	Chattanooga, Tenn.
Months for touring.....	Oct.-March	Nov.-Feb.	Oct.-April	May-Dec.	Oct.-March	Sept.-Feb.	Nov.-Jan.	May-Oct.
Rainy or bad weather season.....	June-Sept.	June-Sept.	June-Sept.	Jan.-March	Sept.-May	Dec.-March	Dec.-March	.....
Too hot for comfort.....	June-Sept.	March-Nov.	May-Sept.	June-Aug.	July-Aug.	July-Aug.	June-Sept.	.....
Do slight rainfalls improve roads.....	Yes	Yes	Yes	No	No	Yes	No	.....
Average cost of gasoline.....	20	18	20	20	.....	20	20	17
Average hotel charges.....	.....	\$2	\$2 and up	\$1.50-\$5	\$1 and up	\$3 to \$5	.....	\$2 to \$3.50
Average garage charges.....	\$5.20 month	65 hr.	\$1	50	.....	50	50	.....
Equipment needed .....	Chains, canvas strips, ax, windlass	Same	Standard	Chains, windlass	Chains, canvas strips, ax	Chains	Chains, ax, windlass	Chains

**Florida**—The many winter resorts, St. Augustine the oldest city, the Ormond-Daytona beach straight-away, the Sanford celery beds, the orange and grape fruit orchards, the De Leon spring at Deland, known among Spanish explorers as the fountain of perpetual youth; Orange City, where the water from the springs is bottled for sale, phosphate mines at Plant City, forts and historical points of interest about Pensacola, turpentine camps.

**Georgia**—Scenery, farms, Chickamauga battle field near Rome, old mill near Allen used by Eli Whitney, inventor of the cotton gin; Augusta, the cotton center; battle ground at Atlanta, Saint Paul's church on site of Fort Augusta and Meadow Garden,

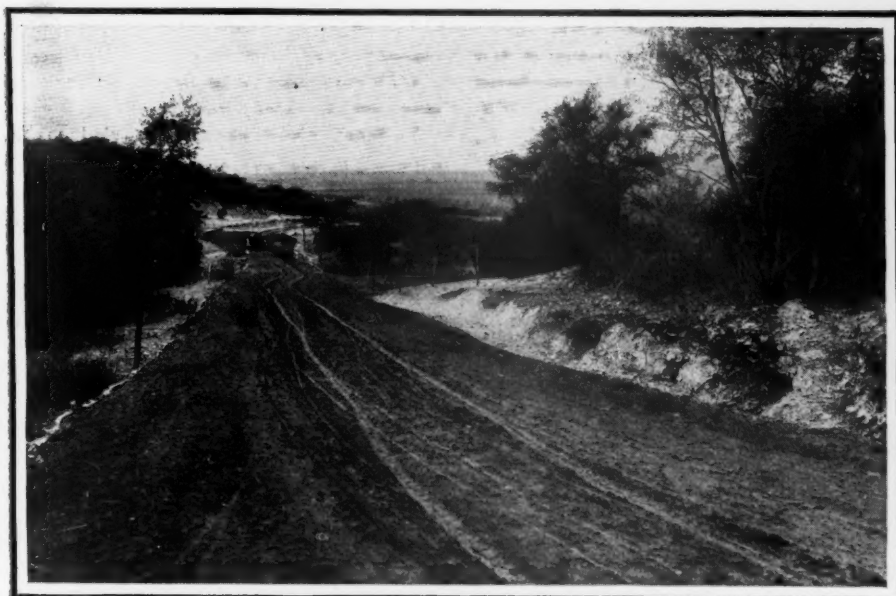
both at Augusta; Fort McPherson in a suburb of Atlanta, remains of the mound builders, the slave market and block at Louisville, Barnesville garden, the bit of England transplanted; Rome, so-called because of the seven hills; the Lord Green house at Savannah; Macon, heart of the peach and lumber section, possesses Wesleyan college, the oldest female college in the world.

**Alabama**—Battlefield of Wauhatchie, building in Montgomery over spot where Jefferson Davis took oath of office, together with the most complete set of Confederate relics in existence; sites of old slave markets, Confederate White House, the large cotton fields.

**Mississippi**—Cotton fields, lumber sections, Vicksburg national park, battle fields of Corinth, Baker's creek, Holly spring, Iuka, Vicksburg, Jackson.

**Tennessee**—First state building at Knoxville still standing, Fort Saunders, scenes along Holston and Tennessee rivers, Chilhowee park, mountain scenery, marble quarries, wooden mantel factories, natural tunnel near Bristol, the Gorge, National Soldiers' home, White Top peak, next to the highest peak east of the Mississippi; Sycamore shoals, historic on account of the revolution; Andrew Johnson's old tailor shop and homestead at Greenville, Watauga mountain scenes, Chickamauga park, Lookout mountain, Missionary Ridge and Orchard Knob

# Touring Information



FINE STRETCH OF ROAD SOUTH OF CLEBURNE, TEXAS

Antonio 25.4 miles, about an 8-hour ride.

Going across the prairies from San Antonio you route through Boerne, Kerrville, Junction, Menardville, San Angelo, Merzow, Barnhart, Ozona, Sheffield, Ft. Stockton, Marathon, Alpine, Marfa, Aragon, Valentine, Wendell, Chispa, Lobo, Dalberg, Torbert, Grayton, Sierra Blanca, leaving the S. P. for Lenear brothers' ranch, returning to the railroad at Clint for El Paso.

You can follow the directions given the Hamilton (Kan.) inquiry to Phoenix, Ariz., and continue through Liberty, Castle Dome, Gila City and Yuma. Crossing the Colorado river into California you proceed to Ogilby, Drylyn, Glamis, Mammoth, Brawley, Imperial, El Centro, El Campo,

Potrero, Dulzura, Jamul, San Diego, which is 433 miles from Phoenix.

From Ft. Stockton to Sierra Blanca, El Paso to Lordsburg, N. M., and from Tucson, Ariz., to San Diego, Cal., you will find running directions in the Blue Book, volume 5. The entire distance is 2,181 miles.

## NORTH PLATTE-HOUSTON

North Platte, Neb.—Editor Motor Age—I want to go from North Platte, Neb., to Houston, Tex.—R. D. Herzog.

By the far the best road for you would be as follows: Go first to Kearney, which is 106 miles through Maxwell, Brady Island, Gothenburg, Millow Island, Lexington, Overton, and Elm Creek, then on the

Sunflower trail to Ellinwood, Kans., the following towns apply: Newark, Minden, Macon, Franklin, Reamsville, Kans., Smith Center, Portis, Down, Glen Elder, Beloit, Victor, Denmark, Vesper, Sylvan Grove, Wilson, Claffin, Ellinwood, 249 miles.

Traveling east on the Santa Fe trail until you reach the Meridian road at Wichita, Kan., the routing is Chase, Lyons, Sterling, Nickerson, Hutchinson, Elmer, Yoder, Haven, Mt. Hope, Colwich, and Maize, with 116 miles on the speedometer. Caldwell, Renfrow, Medford, Kremlin, Enid, Hennessey, Dover, Kingfisher, El Reno, Pocasset, Chickasha, Verden, Anadarko, Apache, Lawton, Emerson, Randlett, and crossing the toll bridge over the Red river north of Burkburnett finds you in Wichita Falls.

About 8 miles south of Wichita Falls beware of mud hole in wet weather, and if bad go back about 150 yards and make a detour through the fields. You should Jacksboro, Whitt, Weatherford, Annetta, next reach Windthorst, then Antelope, Aledo, Ben Brook and Fort Worth.

Fort Worth to Houston is Crowley, Cleburne, Cuba, Grandview, Itaska, Lovelace, Hillsboro, Abbott, West, Waco, so far about 107 miles; then to Houston it is 232 miles through Marlin, Lott, Rosebud, Cameron, Rockdale, Caldwell, Somerville, Brenham, Bellville, Sealy, Wallis, Rosenberg, Richmord and Sugarland.

The running directions as far as Fort Worth are in the Blue Book No. 5.

## Are Planning Spending the Winter Months Traveling Through Southern Territory

Bristol, Tenn.	Memphis, Tenn.	Alexandria, La.	Lake Charles, La.	Pine Bluff, Ark.	Fort Smith, Ark.	Fort Worth, Tex.	Santa Fe, N. M.	San Diego, Cal.	Los Angeles, Cal.	San Francisco, Cal.
May-Sept. April-June	May-Oct.	Nov.-Feb. June-July Aug.-Sept.	Nov.-Feb. June-July Aug.-Sept.	May-Oct. Dec.-March	June-Oct. Feb.-June	Apr.-May Sept.-Nov. June-Aug.	Sept.-June July-Sept.	Jan.-Dec. Nov.-Apr.	Jan.-Dec. Oct.-May	Feb.-Oct. Nov.-Jan.
Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
20	16	16	18	22	17	20	22-30	21 to 35	25	25
\$2 to \$3.50	\$1 and up	\$3.50 and up	\$3.50 and up	\$2 to \$3.50	\$2 to \$3.50	\$2 to \$3.50	\$2.50 and up	\$3 and up	\$3 and up	\$2 and up
	Chains	Chains	Chains	Chains, windlass, ax	Same	Same	Same	Chains	Same	Same

battle fields, Chattanooga national cemetery, Murfreesboro battle ground.

Louisiana—Cotton and rice mills rank second in value of fish catches, sugar cane plantations, quaint New Orleans, sulphur mine and saw mills of Calcasieu parish, oil fields.

Arkansas—Ozark mountain scenery, the famous Hot Springs, excellent fishing and hunting, Little Rock, the city of roses and beautiful homes; Dauxite mines just outside of Little Rock, furnishing nearly all the ore for the manufacture of aluminum in America; the Niloak potteries at Benton.

Texas—Famous battle grounds of San Jacinto, Goliad, Gonzales; the Alamo at San Antonio, the winter resorts at Corpus Christi

and Galveston, splendid fishing along the gulf coast, duck and geese hunting in south Texas and deer near Laredo in the winter, carnivals at Dallas and Houston, and Waco cotton palace; the rice and cotton fields, cattle ranches.

New Mexico—Santa Fe, one of the most picturesque cities in America and the second oldest town in the United States; the Old Palace of Governors, built in 1605 by Onate; the oldest church, oldest house, antedating the missions of California by 100 years; Rito de los Frijoles, one of the most important ruins; Indian villages; Santo Domingo, the largest Indian village and the inhabitants the most primitive of all American aborigines; Mexican adobe houses, the Pecos mis-

sion, battle field of Gorieta, Mexican settlement of Agua Fria, cliff dwellings at Pajarito park, the old curiosity shop at Santa Fe, Taos Indian pueblo.

California—Yosemite valley, General Grant national park, Sequoia national park, the Redwoods near Santa Cruz, Franciscan missions along the El Camino Real, diversity of scenery from the luxuriant semi-tropical scenes of the south to the arid desert and snow-crowned mountains of the Sierras, the orange groves around Los Angeles, the prune and apricot orchards in the San Francisco section, Coronado tent city, Rincon causeway, Klamath falls, Crater lake, Mount Shasta, Donner lake, Lake Tahoe, Catalina Island, ostrich farms, Venice.



## The Horsepower Question

### Iowan Revives Question of Motor Ratings and Asks Various Questions Respecting Design

SIoux CITY, Ia.—Editor, Motor Age—Which is considered the better valve, overhead or inclosed?

2—How do motor companies rate horsepower. One concern with a  $4\frac{1}{8}$ -inch bore by  $5\frac{1}{2}$  stroke will call the motor a 40-horsepower; another with the same bore will say it is a 37-horsepower. How is a buyer to tell?

3—Why was the Abbott-Detroit demerited 1,400 points in the recent endurance run which was won by the Moline?

4—Why is it claimed that four speeds with the fourth direct are better than four speeds with the third speed direct?

5—What motor does the Stutz use?—H. H. Rogers.

1—To compare an overhead and an inclosed valve is like comparing a four-cylinder motor with a water-cooled one. Either



## The Readers

stances, but on the whole is the safest guide in comparison of the power of two motors, provided it is remembered

$D^2NSR$   
that the formula as usually quoted,—, 2.5

assumes a piston speed of 1,000 feet per minute. Of course a motor with a considerable preponderance of stroke over bore will run at a higher normal piston speed. Motors of equal bore will give the same power, regardless of stroke, and therefore of piston displacement, if this exception is not made to the usual formula. A formula that automatically makes this allowance has been prepared by Motor Age. This formula is based on the S. A. E., and gives the same results under the conditions assumed as constant by that formula; making allowances, nevertheless

3—Where can such propellers be purchased? Approximate price.

4—Would like directions for making same out of sheet metal?

5—What speed should the sled make with a 4-horsepower motor cycle motor?

6—What speed should the sled make with a 2-horsepower motor cycle motor?

7—What gear ratio should be used?

8—If spur wheel should be used, how can the spurs be fastened to the rim of the motor cycle wheel? I desire to use it as that will allow using the regular belt drive that my machine has.—Reader.

1—Motor Age would not advise the construction you outline. It would be better to construct a special sled of very light material, 3-runner or a boat built after the lines of ice yachts. Either a spiked wheel or aerial propeller may be used with a sled of medium weight. If you succeed in making the sled quite light, the aerial propeller will prove the most efficient, while in a heavy bob, the spiked wheel will give the best service. The former has the advantage of equal pulling power in snow or on ice.

2—The size, pitch, and angle of the propeller depend on the weight of the sled and speed of the propeller. With accurate data as to the weight of the sled complete, the brake horsepower of the motor at normal running speed, this speed in revolutions per minute, and the character of ground over which it is to travel, an engineer will design a propeller of the proper pitch, diameter and type. A heavy sled will require a lower pitch propeller, as will a sled for use in snow, while a light sled will need a propeller, designed for higher speed. Two blades are to be advised in any case, as such a propeller, if made of wood is stronger than other forms, easier and cheaper to make, and is apt to give higher efficiency than other types, because of the greater development that has been given this type in aerial work.

3—Propellers ready made would probably not suit your requirements, while specially made propellers, in conformance with your specifications, would be quite expensive. The best way would be to have a competent engineer design the propeller, and furnish blue-prints, from which you can make it yourself. A single piece of straight-grained spruce, well shellaced would be found satisfactory for small diameters.

4—Such a propeller cannot be made of sheet metal, as at high speed, sheet metal will not hold together.

5—This depends upon the design of the sled, its weight, and where used. A light, well-built sled, with round polished runners, and well distributed weight might make 30 miles per hour on smooth ice,

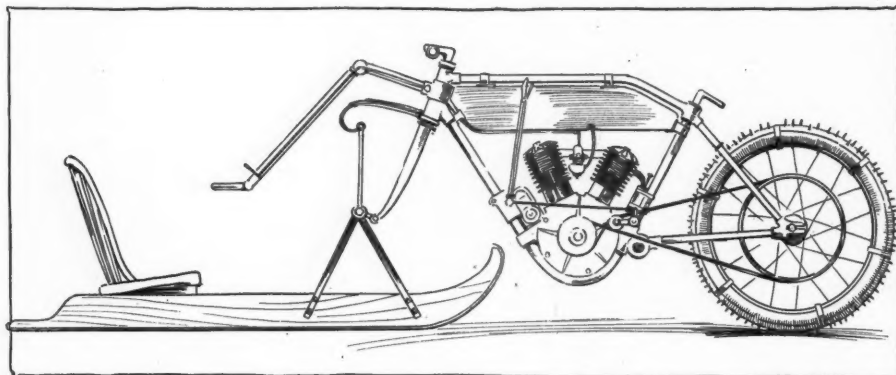


FIG. 1.—EASILY IMPROVED MOTOR ICE SLED

may be either. Overhead valves may be inclosed or not as is seen fit, while L-head and T-head motors may or may not have their valves inclosed.

2—It is generally inferred that the ratings of manufacturers are based on actual horsepower tests, either by indicators, brake tests, or dynamometer readings. It is quite possible that the maker who rates his  $4\frac{1}{8}$  by  $5\frac{1}{2}$  motor at 40 horsepower is right, as is the other maker whose cylinders measure the same, as the latter may employ a design that gives less power for a given cylinder size. You do not state the stroke of the second motor, which may be shorter than that of the first, therefore, causing the motor to develop less power. Also different manufacturers rate their motors at different speeds. Two makers whose motors develop the same power at equal speeds may rate them at different speeds, thereby making a difference in the rating. The S. A. E. formula was devised for the purpose of providing a safe and impartial horsepower guide for buyers. It is not strictly accurate, and does not take into account the difference in design of two motors to a sufficient extent in many in-

for deviations from such conditions. This formula is:—

$$H. P. = \frac{D^2NSR}{15000}$$

In which,

D is the diameter of the cylinder in inches,

N is the number of cylinders,

S is the stroke in inches,

and R is the revolutions per minute.

3—This car was demerited for radiator leaks, caused by a stick running through the radiator, for replacement of the radiator, and for lateness.

4—This point was discussed at length in the issues of Motor Age of July 11th and July 18, 1912. It still remains practically a matter of personal preference.

5—The Stutz motor is a Wisconsin.

#### DESIGNING MOTOR BOB-SLED

Owosso, Mich.—Editor Motor Age—I desire to make a motor sled. The bob will be made of two boys' sleds connected with a plank, such as commonly used for coasting. Would the air propeller be better than a spiked wheel?

2—If air propeller, what size, number of blades, pitch, etc.?

# Clearing House



while a strongly built bob-sled, of reasonably light construction should make about 10 miles per hour on ordinary ice or crusted snow.

6—So small a motor would be very inefficient, and if used at all should drive through a spiked wheel. It is doubtful if greater speed than 15 miles per hour could be gotten from such a motor.

7—Any type of air propeller should revolve at about 900 revolutions per minute. With the ordinary motor cycle motor, whose normal speed is about 2,000, this would mean a gear ratio of about  $2\frac{1}{2}$  to 1.

8—The spur wheel should be made of a light metal flange fitted with sharpened nails, preferably horseshoe nails, over the tire, securing it by leather thongs or straps, and inflating the tire beneath it. A canvas strip should be inserted between the tire and the nail-heads to protect the tire from injury. The wheel should be placed where it will receive the least side-strain, as near as possible to the turning center, and attached to the sled by springs, so that it will bear on the ice with considerable pressure, although the runners should support the sled. If single runners are used, the wheel and motor may be mounted on a forward tractor truck, arranged with a tiller for steering, as in Fig. 1. In this figure, an ordinary motor cycle is shown, with the handle-bars, saddle, and front wheel removed. It is attached to the sled as shown, and may either draw the sled or push it. In the first case, the belt will have to be lengthened and twisted over once to run the wheel in the opposite direction. If it is used to push the sled, the belt that is ordinarily used is employed, and the tiller is bent to extend under the operator's arm. Fig. 2 is a suggestion for an aerial-propeller drawn sled. In this design a light sled is drawn by an aerial tractor with a single runner. The frame may be made of light steel tubing, piping, or of wooden shafting. The draw-bar that is used is double-jointed.

## THREE-POINT SUSPENSION AGAIN

Clinton, Ia.—Editor Motor Age—What are the advantages from an engineering standpoint of three-point suspension of the motor in a motor car? I know what arguments are advanced in its favor but I would like to have the advice of Motor Age as to the advantages or disadvantages the three-point suspension plan has over four-point, treating the subject from the standpoint of practical construction. If there is any advantage in three-point suspension, why is it that so many of the manufacturers of high-grade cars do not adopt the same?—J. H. Ingwersen.

Three-point suspension is a simple

mechanical proposition, and if discussed from the standpoint of the engineer, the problem is in no way modified, but is simply expressed in terms beyond the ken of the average layman. The salesman who holds his business card by two fingers of his left hand and one of his right, and then twists his hands, is demonstrating all there is to the three-point suspension principle. If he holds the card at four point and twists his hands, the card is twisted also. This is merely an extreme application of the same principle that is applied to motor car design; the card representing the motor, and the salesman's hands the frame from which it is suspended.

As a common-sense theory, nothing could be more obvious than this simple exposition of a world-old principle. The farm-hand who sits upon a three-legged stool in milking, is applying the same principle. The three-legged stool will set securely upon any surface, regardless of how uneven it is, while a four-legged stool will only rest on three-legs if the surface is not flat. This will bring stresses to bear on the stool, as a result of the distortion of the surface of support. In the motor car engine, the points of support are to a certain extent flexible, so that if the frame-distorsion be not too severe, the stresses to which the engine is subjected are not serious enough to cause any uneasiness. If, however, the points of support are some distance apart, the relative movement of the frame will be greater, and a broken support arm may result. This is why six-cylinder motors, except where extremely heavy and rigid frames are used, are usually suspended on three points, while in good four-cylinder practice, both three and four-point suspensions are used.

## Features of Racing Cars

### Perceptive Californian Is Curious About Features of Racers That Are Seldom Mentioned

FRESNO, Cal.—Editor Motor Age—Which is best adapted for racing, a narrow or a wide tread?

2—What kind of oiling system is used on most racing cars?

3—What is the reason for Stutz racing cars having holes bored through the axle and between the bolts on the hub flange?

4—What is the object of racing cars having holes bored in the pistons?

5—What is the reason for racing cars having only one ring to the piston, and is the piston in such cars turned for one ring or for as many as are generally used?—Jas. Michaelian.

1—The narrower the tread, the lighter the car may be made, within reasonable limits, and the less wind-resistance is offered. Also a narrow tread secures better traction on the turns, as the difference in the speeds of the inner and outer wheels is not so great. On the other hand, a narrow tread is not as safe as a wide one, and is more difficult to control at high speed. The turns may be taken at higher speed with a reasonably wide tread, as the points of support are sufficiently wide apart to allow a wide margin of safety for the center of weight.

2—Most racing cars use an oiling system of greater pressure than do touring cars. Many use non-splash systems. The difference in requirements consists in the need of more oil to cope with the greater speed and the intense heat of a racing motor in action.

3—This is for the sake of lightness.

4—This too, is partly for the sake of lightness.

5—The great heat of a racing motor causes the piston to become hotter than that of a touring car, so that it expands more, and requires more clearance. At the rapid speed of the piston, the compression may be held with less packing.

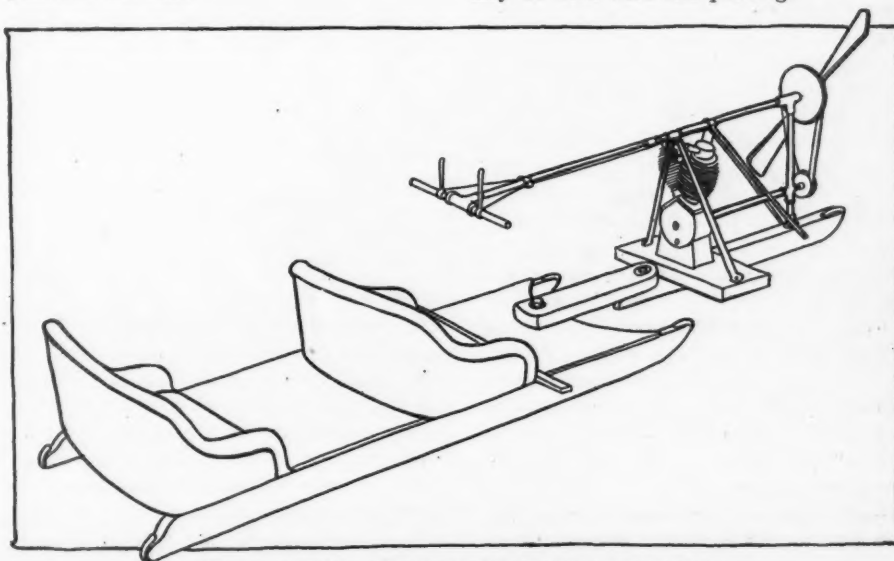


FIG. 2—AERIAL MOTOR TRACTOR FOR ICE SLEIGH



# The Motor Car Repair Shop

**T**HERE are two ways of finding trouble. One way is to dig right in and test every feature that may in some way be directly or indirectly connected with the symptoms; the other is to carefully weigh the possibilities by first turning the situation over in mind, and after having arrived at a most plausible cause for the trouble, proceed to prove the diagnosis. The first is a hit-or-miss method gen-

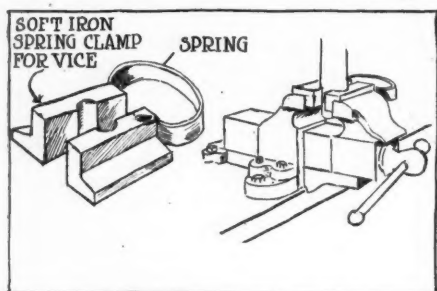


FIG. 1—HANDY VISE CLASP

erally employed by novice and grandstand experts, while the latter is the direct course followed by those who would be successful trouble-hunters. The writer has seen days wasted in overhauling an entire ignition system to eliminate a miss that was caused by loss of compression; an entire set of valves ground in to recover lost compression that was caused by a defective valve cage gasket; and an entire set of bearings examined to locate a pre-ignition knock. These are some of the common cases in which much time, trouble and expense might have been eliminated had a little logical forethought been used.

## Testing Alignment of Frame Horns

Very often the motor car repairman is required to fit a new front spring into a chassis, and experiences considerable trouble at times in getting the spring shackle bolts into place. Generally it does not take long to learn that the trouble is due to mis-alignment of the hole in the spring eye and those of the spring horns or shackles; and by lowering or raising one end of the axle it usually is possible to get the bolts into place. Thus the spring shackle bolts are very often assembled with the springs twisted out of their normal position, with the result that they almost continually are subject to an abnormal binding strain that should not exist, and which causes rapid and uneven wear of the bolts, to say nothing of the consequent squeaks and rattling noises.

In Fig. 2 is shown in a very simple method by means of which the alignment of the bolt holes in the horns or ends of the frame may be tested. It consists simply of a straight round steel rod of the same diameter as the spring shackle bolts. If this rod can be easily slipped through

## Aligning the Car Frame

all the spring-shackle bolt holes of the frame, as indicated in the illustration, it is a fair indication that the holes are in alignment. When the springs are secured in their proper positions on the axles, the alignment of the spring eyes should be tested in the same manner. Thus when both the holes in the frame and the springs are in alignment with each other there not only will be a marked absence of trouble in assembling these parts, but the excellent wear of the pins or bolts obtained thereby will also be a decided advantage in favor of the use of this simple device. It should therefore be a feature of the equipment of every motor car repairshop.

## A Handy Vise Clamp

In the repair of motor cars there are many parts such as the highly finished shafts of the change gear set, etc., that must be securely gripped in a vise during the processes of repair, and a suitable means must be provided so that the surfaces of these parts will not be damaged by the jaws of the vise. For this purpose many shops are equipped with lead or copper covers for the jaws of the vise. These are not always practicable, however, especially when it is required to hold a delicately finished round shaft securely from turning, for the lead and copper being soft and offering but comparatively little frictional resistance, will allow the shaft to turn in the vise and perhaps mar the surface of the shaft. To avoid this one well equipped repairshop is equipped with clamps such as is shown in Fig. 1. It is made from soft iron and forged into shape, and is designed to fit into the vise in practically the same fashion as the lead and copper vise-jaw covers so generally used. It differs, however, in that it is made of iron, has a connecting portion bent into a loop to form a spring, and there is a semi-cylindrical groove in each half of the jaw covers which conforms to the shape of the round shafts, for the gripping of which the device was designed. These grooves register with each other when the jaws of the vise and clamp are drawn together.

## Kerosene on Magneto

Not very many men use kerosene as a means of cleaning delicate parts such as those found on a magneto, but if tried it will be found that the gum and dirt that usually accumulate on the breaker points of the magneto will soon disappear. Very often the motor will stop without any visible disarrangement being found. A few drops of kerosene on the breaker points will often clear the mystery, for kerosene

has the ability of washing away carboniferous matter more readily than any substance known.

## Care of Leather Tops

Leather tops often become spotted due to the fact that rain water has not been brushed off with a cloth. Usually the water is allowed to evaporate, but the inevitable result is a number of unsightly spots. These, and spots due to other causes, may be removed by using spirits of sal ammoniac as the cleanser. A little of the spirits should be allowed to remain on the spotted portion of the top for a few minutes and then rubbed off. The top should then be washed with clean water and dried with a cloth. This method usually is successful.

In snowy weather the best method of preserving the top is by the use of castor oil. If applied but once a month it not only keeps the top waterproof but preserves the leather. The oil should be applied with a soft rag and rubbed in. A former practice and a poor one was to use linseed oil, but this has been found to rot the leather instead of preserve it.

## Graphite in Lubricants

Graphite used as a lubricant in connection with some other lubricant is far superior to oil or grease used alone. It has been found, especially in the lubrication of ball bearings, that if graphite be

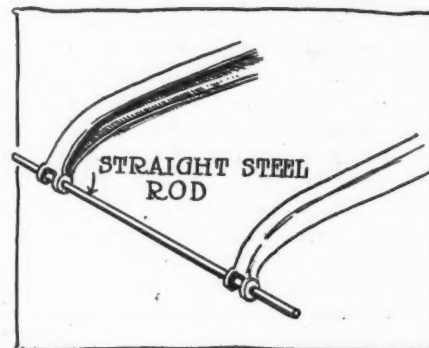


FIG. 2—METHOD OF ALIGNING FRAME HORNS

mixed with the grease better results will be obtained than if grease alone were used. The market already offers some preparations based upon the practicability of this theory and not only are these preparations to be used in connection with bearing lubrication, but with cylinder lubrication as well. For the transmission a mixture of one-third graphite, one-third grease and one-third transmission oil will be found to be much more satisfactory than the use of oil alone. It has been found by experiment that combining the graphite with the ordinary lubricant increases the viscosity and flashing point, two factors desired of a perfect lubricant.



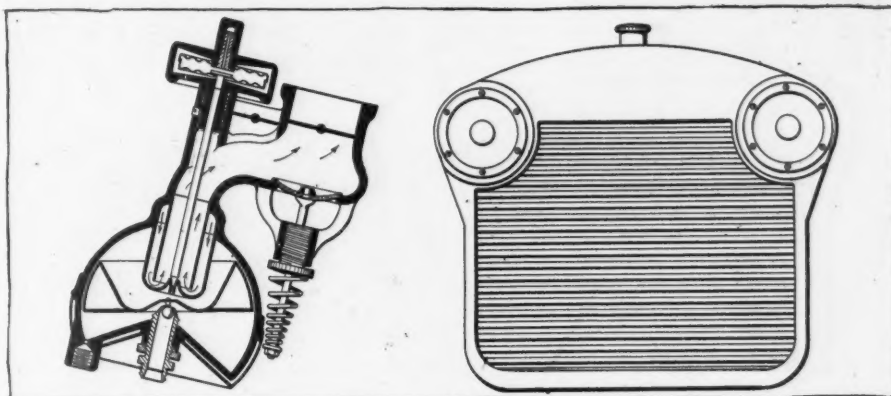
# Current Motor Car Patents



**DIRECTION Signal for Motor Vehicles**—No. 1,048,702—To William Belvie Johnson, Richmond, Va., assignor of one-tenth to William B. Daniel, Richmond, Va. Filed June 25, 1912, dated December 31, 1912. To indicate the direction to be taken by a vehicle to other users of the roads, this device consists of a vertical shaft mounted on a motor car, to the upper end of which is secured a pointer or arrow, adapted to point in the direction which the operator wishes to indicate. The shaft is mounted on the roof of the vehicle by means of a casing, through which it extends down into the body of the car, within the reach of the driver. This casing is provided with notches into which lugs on a disk secured to the shaft are adapted to enter, in four separate places, forward, left, right and reverse. A handle and indicator on the lower portion of the shaft are used to operate the signal.

**Motor Car Radiator-Lamp**—No. 1,048,530—To Don W. Harlow, Cleveland, O. Filed February 5, 1912, dated December 31, 1912. This device is similar to the radiator-lamp used on the new Garford car, and consists of a radiator for a motor car engine, in which one or more lamps are countersunk, so that they present a clean and flush appearance, protection of the lamps from harm, the saving of considerable bright work to clean, and the cooling of the lamps. This patent relates in particular to two lamps, removably secured in sleeves at the sides of the radiator.

**Carbureter**—No. 1,049,038—To Welch Barstow and Seymour K. Bradford, Palo Alto, California; said Barstow assignor of one-hundredth part of said right to said Bradford, and forty-nine-one hundredths to B. B. S. Mfg. Co. Filed November 4, 1911, dated December 31, 1912. Several radically new features are embodied in this invention, the principal of which is an automatic adjustment of the gasoline flow to correspond with the atmospheric pressure. This is accomplished by a barometer. Another unique feature is a provision to maintain the gasoline level



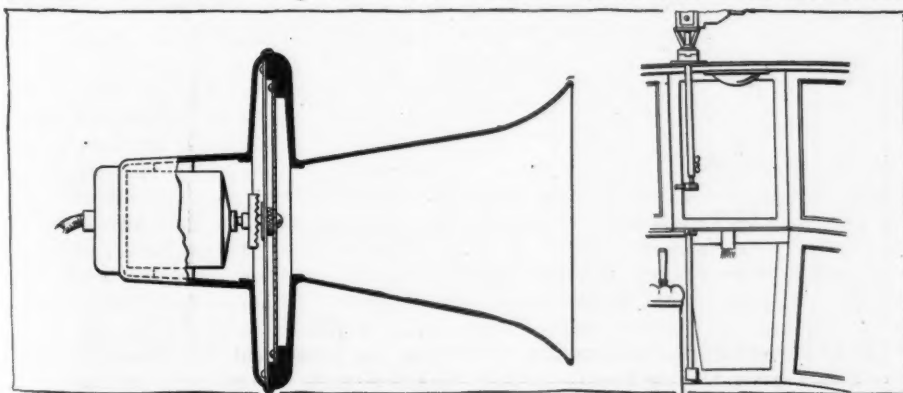
WELCH & BRADFORD CARBURETER AND HARLOW RADIATOR LAMP'S

regardless of the car angle, and to feed to the nozzle at a uniform pressure, regardless of the gradient upon which the car is traveling. The latter is accomplished by means of a spherical float-chamber, within which a metal float is disposed. This float is flat on the bottom and funnel shaped at the top, affording free access of the fluid at the nozzle outlet. Both the nozzle outlet and the fuel intake are located at approximately the center of the spherical float-chamber, and the float-valve is in the form of a ball, within the float-valve, which is closed by the buoyancy of the float when the level is up to normal, but which is opened by its weight, upon the level falling below this. The nozzle is in the form of two concentric tubes, with the jet in the lower portion of the outer one, which has a closed end. A needle-valve seats in this jet, and is controlled by an aneroid barometer, situated in a casing above the carbureter. This casing has an opening to the atmosphere and contains two halves of a telescopic vacuum chamber, the upper portion of which is secured to the casing, and the lower to the needle-valve stem. When the pressure of the atmosphere is great, the barometer will contract, and the needle-valve will be raised from its seat, permitting a greater amount of fluid to enter into the mixture. The air is taken from an air-inlet at the

top of the carbureter, down between the two nozzle-tubes, past the jet, and upward through the central tube through the mixing chamber, to the throttle. In the mixing chamber is located an auxiliary air valve, which is made with a cup-shaped inside face, to facilitate its operation by the engine suction. Twin butterfly valves in the adjacent main air and throttle throats are connected by a slightly off-set linkage, so that the supply of regular air is controlled by the throttle-opening. The angular position of the carbureter shown, is used to illustrate the independence of the fuel feed of the position of the car.

**Electric Horn**—No. 1,049,272—To Ernest Rubes, Brooklyn, N. Y. Filed September 26, 1911, dated December 31, 1912. This electric signal, which is designed to be operated by an electric motor, operates on the toothed wheel and diaphragm principle, and differs in that two diaphragms are used instead of but one. The rear diaphragm bears on the toothed wheel by means of a metal button, and vibrates the outer diaphragm through a sound-absorbing element, thus preventing harshness.

**Hyatt Combination Bearing**—No. 1,049,501—To Charles S. Lockwood, Newark, N. J., assignor to Hyatt Roller Bearing Co., Harrison, N. J. Filed October 6, 1911, dated January 7, 1913. In a Hyatt roller bearing, this patent refers to divided rollers, with thrust members between them, such thrust members being independent of the rollers themselves. The bearing consists of the usual inner and outer races, with two cage rings, carrying spindles, on which are mounted two sets of spiral steel rollers. Between these two sets is a bevelled disk mounted on the roller spindle, and running in grooves in the raceways. Friction between the rollers and spindles is reduced by loose collars on the spindles, supporting the outer ends of the rollers. Adjustment and means of inserting the thrust disk is provided by a sleeve, forming one side of the outer race.



RUBES ELECTRIC HORN AND JOHNSON SIGNALLING DEVICE





CAT &  
DOG  
MOTOR  
PLUG

# The Motorist's Kindergarten



EDITOR'S NOTE—Motor Age is publishing in this department a series of non-technical explanations of the various parts of motor cars for the benefit of the reader who knows nothing about them. The subjects will be dealt with in the most elementary manner, so that the series when completed will form a simple elucidation of the car. The first article appeared October 10, 1912.

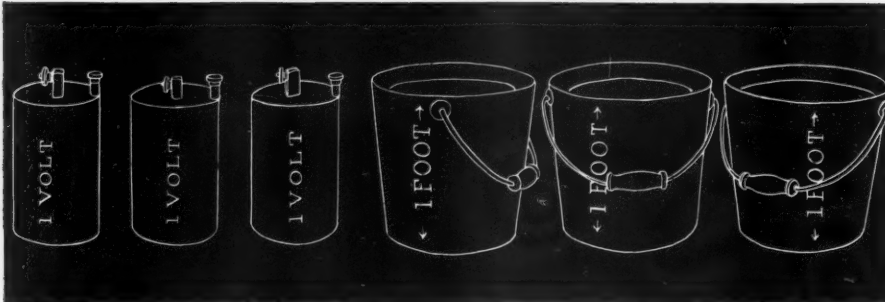


FIG. 24—COMPARING DRY CELLS WITH PAILS OF WATER

**D**RY cells of any size or make will give a current of electricity with a pressure of about  $1\frac{1}{2}$  volts, but this usually drops a little so that one may be safe in figuring on a pressure of  $1\frac{1}{4}$  volts. The current that each cell will give, or as it is often called, the amperage of each cell, varies according to the size of the cell, the larger cells giving a greater current. Different makes of cells, too, will give different amounts of current, some giving high current at first but soon dying out, others giving a comparatively low current which is constant for a long time. The latter class are considered better for use in motor cars. All dry cells, however, give less current as they get older, so it is a poor investment to buy them in any quantities.

The first question that occurs to a motorist is—how many dry cells will I need? Usually the ignition system of a motor car is made so it will work with a pressure between 4 and 6 volts, for the current must be high enough to make the apparatus work properly. The resistance that the electricity meets in the wiring of the ignition system is so great that if you only had a pressure of 1 volt, this would not be sufficient to force a big enough current through the wires, as explained last week. As the pressure increases the quantity of current that flows becomes greater. It has been found that with a pressure between 4 and 6 volts, there is sufficient current for most ignition systems.

The way we build the pressure up to 6 volts, say, with cells which give only  $1\frac{1}{4}$  volts is by connecting them in series, as it is called. This can be explained by going back to our hydraulic analogy. Suppose we had three pails of water, each of them 1 foot high, as shown at the right in Fig. 24, and suppose we had three dry cells, each of them giving a pressure of 1 volt, we will say for the sake of sim-

## Dry-Cell Connections

plicity. If we would take these three cells and set them one on top of the other, and make an opening in the bottom of the three pails, connecting the opening in the bottom one with a pipe, the pressure in the pipe would be three times as great as if we had only one pail. That is, we would have a head of 3 feet of water on the pipe and the water would squirt up 3 feet in the air, as in Fig. 25.

There is another way in which we can attach the three pails of water to the pipe, and that is the arrangement shown in Fig. 26. Instead of setting one pail on top of the other we have them all on the same level and if we connect the bottom of each one to the pipe the water will flow through the pipe, but we will have only 1 foot of head and the water will squirt only as high as the level of that in any one of the three pails. That is, the pressure would be no greater with the three pails connected this way than it is if there was only one pail connected

with the pipe. We can do almost the same thing with the electricity in the three dry cells as we did with the water in the pails, that is, we can connect them up so that the pressure of each of them is added to that of the rest, or we can connect them up so that the pressure of all three is equal only to that of one.

When the cells are connected so that the pressures in them are added, it is called a series connection because it corresponds to putting the pails of water in a series one above the other. To make this connection, which is shown at the left of Fig. 25, we connect the positive terminal of one cell with the negative terminal of the next, the positive terminal of that one with the negative of the next, and so on. Finally, running one of the wires of the outside circuit, from a lamp in this case, to the negative terminal of one end cell and the other outside wire to the positive terminal of the other end cell. Since there is a pressure of 1 volt, we will say, between the positive and negative terminals of each cell, we have simply added the voltages of all the other cells to it, just as we added the pressure in the other pails of water to the first one when we set the others on top of it.

The other arrangement, illustrated in Fig. 26, is called the parallel, or multiple arrangement, and corresponds to connecting the pails of water to a pipe when all of them are at the same level. When we connected the pails of water in this way we simply added to the capacity of one pail without increasing the head or pressure. When we connected the three pails set on a level it was just as though

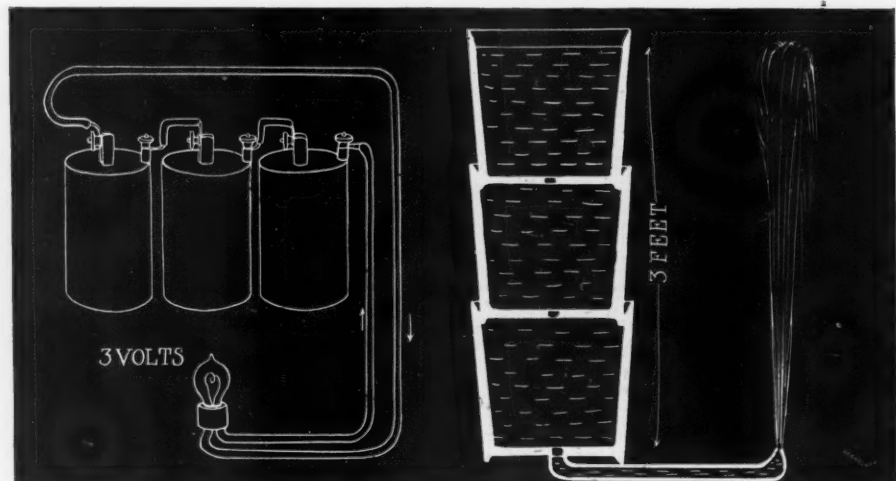


FIG. 25—DRY CELLS CONNECTED IN SERIES AND HYDRAULIC ANALOGY

we multiplied the size or capacity of one pail by three. In the multiple or parallel arrangement of a dry cell we simply connect all the positive terminals, or plates, and all the negative terminals, or plates, together, and the effect is merely that of adding to the size of the plate or capacity of the cell. When we connect the three cells in multiple or parallel, as in Fig. 26, we have multiplied the capacity of the cell by three, but we did not increase the pressure.

If we increase the size of the plates in a cell we lengthen the time during which it will give a current of electricity. If one dry cell will give 1 volt for one day three dry cells would give 1 volt for three days if connected in multiple, but if connected in series, as shown at Fig. 25, we would get 3 volts pressure but the three cells would only last one day. This can be explained by considering the water pails again with the pails one on top of the other, giving a 3-foot head, the water would run out in one-third of the time that it would if the pails were connected together as at the right of Fig. 26, where they get only 1-foot head. It will be seen that in series connecting we multiply the voltage but leave the volume the same, and in parallel connection we multiply the volume but leave the pressure or voltage the same.

In order, then, to get a pressure of from 4 to 6 volts, with dry cells giving  $1\frac{1}{4}$  volts each, we simply need to connect four cells in series, for then we will have four times  $1\frac{1}{4}$ , or 5 volts, which is pressure enough for the ordinary ignition system. It is not well to use more cells in series than are needed for good working, because the excess of pressure would force the electricity through the circuit at too great a rate and the high current would damage the vibrators of the spark coils as will be explained later on.

With the four cells connected in series and giving 5 volts pressure, we have the life of only one cell, that is, the four cells connected this way will not last any longer than if we had only one cell. We can

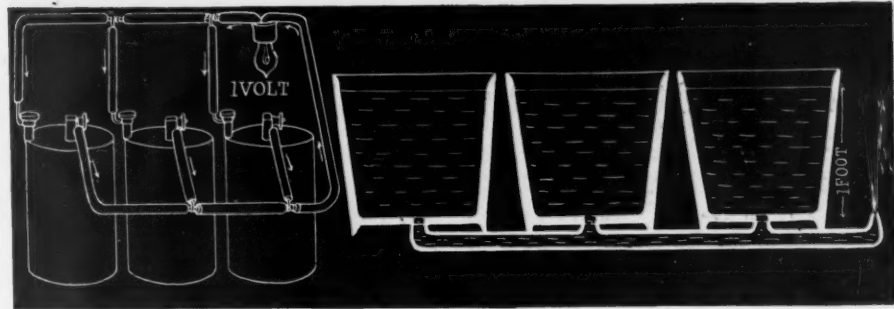


FIG. 26—PARALLEL CONNECTION OF DRY CELLS AND CORRESPONDING ARRANGEMENT OF WATER PAILS

double the life of the battery thus obtained by connecting the four cells in series simply by connecting up four more cells in series and then connecting the two sets of four cells each in parallel or multiple. The arrangement is illustrated in Fig. 27, in which case we have three of the 1-volt cells we spoke of, connected in series and three more in series, with the free negative terminals of each set tied together and the free positive terminals of each set tied together.

Here we have obtained a pressure of 3 volts by connecting three cells in series and have doubled the life or capacity by connecting in parallel another three which have been connected with each other in series. The effect is just the same as if we had taken three cells of double the capacity and connected them in series. We would accomplish the same result with water pails by making two piles of three each and connecting both to the same pipe, as indicated at the right of Fig. 27. Here we have obtained a head of 3 feet and doubled the capacity of our source by doubling the amount of water.

Series connection means that the carbon of one cell is connected to the zinc of the second; the carbon of the second to the zinc of the third and so on. This leaves the carbon of the last cell free to be connected with the outside circuit, likewise the zinc of the first cell. So, when the entire battery of cells flows from the outside carbon through the lamp or ignition coil, or whatever is in the outside

circuit, and back to the battery through the zinc of the first cell.

In a motor car where dry cells are used for ignition it will be found necessary to use two sets of cells which are not connected to each other but either one of which can be switched into the circuit if desired. In fact, it will be found almost necessary to change from one set to the other every 25 to 50 miles. Otherwise the engine will begin to miss and finally will stop. This is because the current flows through the cells so rapidly too much gas forms for the depolarizer to take care of and the cells polarize. After resting a while the cells will be restored at least in part, to their former condition and can be switched on again.

But if there are eight cells connected in two sets of four in series and these two sets connected in parallel in the series-parallel arrangement explained above, the current from each cell is lessened and they last very much longer. In the pail parallel arrangement, illustrated in Fig. 27, the current flows from the carbon of one end cell through the circuit and back to the battery through the zinc of the same cell so that the current from the first cell does not have to flow through the second and third cells in order to go through the circuit and back to where it started but is able to flow past them. The current from each of the three cells flows into the wire connecting their carbons and on its return flows back into the cell from the wire connecting their zincs. If you have a current of four amperes in the circuit each cell will be giving one-third of the current and only one-third of it will be flowing through any one cell. With two sets in multiple only half the current will be flowing through each cell.

It should be remembered that dry cells are excellent for intermittent service, as for motor starting or for use with an electric horn, but for continuous service the dry cell is not a suitable source of current. For motor ignition after the engine has started running the dry cell is a poor generator to use, for it becomes exhausted in a short time. For continuous current service the most efficient means of obtaining current is by means of a storage battery, or as it is sometimes called an accumulator. This type of electric generator is undoubtedly in more common use for ignition than the dry cells.

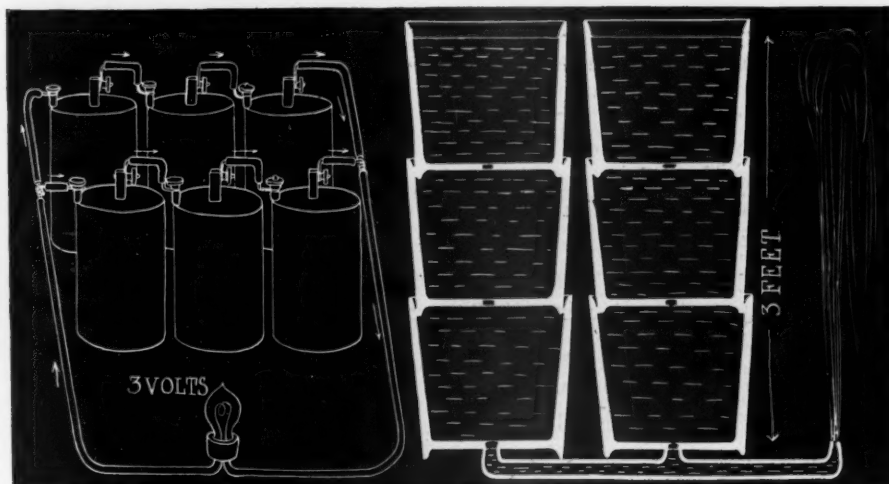


FIG. 27—PARALLEL ARRANGEMENT OF DRY CELLS AND WATER PAILS



## Among Makers and Dealers

**COSHOCTON May Make Cars**—A project is on foot at Coshocton, O., for the organization of a concern to manufacture cars. It is proposed to take over the plant of the Premium Mfg. Co. and manufacture a medium-priced line of cars.

**One of the Veterans**—The Richmond, not the Wayne, is the product of the Wayne works of Richmond, Md., as stated in Motor Age last night. The makers of the Richmond are among the veteran car manufacturers of Indiana, dating back to 1902.

**Buick Man in Argentina**—G. D. Cairns has sailed from New York for Buenos Aires, Argentina, to assume the management of the technical department of the Buick branch of the General Motors Export Co. The General Motors Export Co. reports Buick export shipments during November and December as \$687,710.

**Invents Vibration Absorber**—F. W. Lancheester, consulting engineer of the Daimler company, has recently brought out a vibration absorber for four-cylinder motors. It consists of a twin cross shaft-driven from the motor crankshaft and carrying balance weights, which revolve at double crankshaft speed.

**Show Officers Elect**—The Grand Forks Automobile Dealers' Association, of Grand Forks, N. D., has elected officers and set as the dates for the fourth annual show February 18-21. Officers are: President, Leslie Stinson; secretary, F. Haverland; treasurer, H. W. Sims; advertising manager, James Lyons.

**Swanbrough Wins R. C. H. Pennant**—The R. C. H. sales pennant for November has been awarded to E. W. Swanbrough, manager of the Denver branch, who secured the highest average upon sales for that month. The Denver branch sold nearly twice the number of cars allotted for November, making a record of 183 per cent. This was 43 per cent higher than the Los Angeles branch, which won the pennant a short time ago. The prize went to Kansas City for the month of October.

**Garford Adds to Plant**—The Garford Co. is adding nearly 40,000 square feet of floor space to its plant at Elyria, O., for the manufacture of Garford pleasure cars and trucks. The new buildings consist of a warehouse, 60 by 300 feet, of reinforced concrete; a rear axle assembly shop, one story high, 56 by 280 feet, also of reinforced concrete, and an addition to the main building, 45 by 45 feet and four stories high. The latter will be of steel and concrete construction, to conform with the style of the present main building of the plant. The stock and tool rooms, now housed in the main building, will be

moved to the new assembly plant, allowing for the installation of a great deal of new machinery.

**Assembling in New Orleans**—Increasing demand for motor cars in Central and South America has caused the Buick company to make arrangements for the assembling of its cars for this trade at New Orleans. Cheaper freight rates are thus available and as such shipments require extra heavy crating it is impractical to pay freight on extra heavy crating from Flint, Mich. Other motor car manufacturers are making arrangements to handle cars in the same way at this port.

**To Make Hydraulic Transmissions**—Within a short time a factory will be opened in Indianapolis for the manufacture of a system of hydraulic transmission for motor cars. The factory will be conducted under the name of the Summers Brothers Co. The product to be manufactured is the invention of Summers Brothers, of Glasgow, Ky., and a number of business men of Glasgow will be interested in the concern which is being organized to establish the plant in Indianapolis.

**High Gasoline Freight Rates**—An effort is being made by motor car dealers and others interested to secure a reduction of the freight rates on gasoline between New Orleans and Guatemala City. The high cost of gasoline in Latin America is one of the serious drawbacks to the use of motor cars. Added to the wholesale cost of 100 gallons of gasoline in New Orleans is \$10 for the iron container; ocean freight New Orleans to Barrios, \$10; customs duty, \$5; railroad freight Barrios to Guatemala City, 195 miles, \$16.50. Laid down in

Guatemala City, 1 gallon of gasoline now costs about 55 cents. It is retailed from 65 to 75 cents.

**Wrong Prices Given**—In two instances in the January 9 issue of Motor Age wrong prices were given in the illustrated section. The Cartercar coupe, model 5-C, sells at \$1,900 instead of \$2,250, while the Case model N sells at \$1,500 instead of \$2,500.

**Rayfield Holds Booster Dinner**—The carburetor question was discussed at the annual meeting and booster dinner of the Rayfield sales and service departments of Findeisen & Kropf Mfg. Co., at the New Southern Hotel, Chicago, on January 6. Booster and ginger talks were delivered.

**Testing Motor Tops**—In order to test the waterproof qualities of the mohair used in the tops of Moon cars, the Moon Motor Car Co., of St. Louis, has kept a bag made of it filled with water for the past 2 years. Not a drop ever has leaked through this material.

**Not Croxton-Keeton Outgrowth**—The Keeton Motor Co. corrects a statement made in Motor Age January 9, relative to the company. "The Keeton Motor Co. is not an outgrowth of the Croxton-Keeton Co. in any sense of the word except that the head of our company, Mr. Keeton, formerly licensed the Croxton-Keeton Company to build a French-type car of his design. We are making only one chassis, a 48-horsepower six-cylinder," the company states.

**Juno Incorporates**—The Juno Motor Truck Co. Juneau, Wis., formerly the Brodesser Motor Truck Co., of Milwaukee, has filed articles of incorporation in Springfield under the laws of Illinois. The capital stock is \$125,000, of which amount \$10,000 is represented in Illinois and the remainder at Juneau, Wis. The objects of incorporating under Illinois laws is not given out, but it is known that it is not contemplated to move into that state. At

## Coming Motor Events

### SHOWS

January 11-18—New York pleasure car show; Automobile Board of Trade; Madison Square Garden and Grand Central Palace.  
January 11-18—Milwaukee, Wis.  
January 11-22—Brussels, Belgium.  
January 20-25—New York truck show; Automobile Board of Trade; Grand Central Palace and Madison Square Garden.  
January 18-25—Philadelphia pleasure car show.  
January 20-25—Lynn, Mass.  
January 21-26—Toledo, O.  
January 25-February 1—St. Johns, N. B.  
January 25-February 1—Providence, R. I.  
January 25-February 1—Montreal, Canada.  
January 27-February 1—Rochester, N. Y.  
January 27-February 1—Ottawa, Ont.  
January 27-February 1—Scranton, Pa.  
January 27-February 1—Detroit.  
January 27-February 1—Buffalo, N. Y.  
January 27-February 1—Philadelphia truck show.  
January 27-February 13—Troy, N. Y.  
February 1-8—Chicago pleasure car show; National Association Automobile Manufacturers.  
February 3-8—Washington, D. C.

February 10-15—Chicago truck show.  
February 8-15—Hartford, Conn.  
February 10-15—Minneapolis.  
February 12-15—Geneva, N. Y.  
February 11-15—Binghamton, N. Y.  
February 12-15—Geneva, N. Y.  
February 15-22—Newark, N. J.  
February 15-22—Albany, N. Y.  
February 16-23—Richmond, Va.  
February 17-22—Kansas City.  
February 18-19—Madison, Wis.  
February 18-21—Grand Forks, N. D.  
February 18-22—Baltimore, Md.  
February 19-22—Evansville, Ind.  
February 19-22—Bloomington, Ill.  
February 19-23—Topeka, Kans.  
February 19-23—New Orleans, La.  
February 22-March 1—Brooklyn, N. Y.  
February 20-March 1—Toronto, Canada.  
February 24-March 1—St. Louis, Mo.  
February 24-March 1—Memphis, Tenn.  
February 24-March 1—Cincinnati, O.  
February 24-March 1—Omaha, Neb.  
February 24-March 1—Paterson, N. J.  
February 24-27—Kansas City truck show.  
February 25-March 1—Syracuse, N. Y.  
February 26-March 1—Fort Dodge, Ia.  
February 26-March 1—Glen Falls, N. Y.  
March 3-8—Sioux City, Ia.  
March 3-5—Cincinnati commercial show.  
March 3-8—Bridgeport, Conn.  
March 3-8—Pittsburgh, Pa.  
March 3-9—Des Moines, Ia.  
March 5-8—Tiffin, O.  
March 5-8—Louisville, Ky.  
March 8-15—Boston, Mass.  
March 11-15—Truck show, Des Moines, Ia.  
March 19-25—Boston, Mass.  
March 20-24—New Orleans, La.  
March 24-29—Indianapolis, Ind.

the annual meeting held recently excellent reports were made by the officers and a substantial dividend was declared. L. C. Pautsch is president and Henry A. Henning is secretary.

**Rolled Gear Company Formed**—The Anderson Rolled Gear Co., Cleveland, O., has taken over the new plant of the Cleveland Drop Forge Co., recently defunct and now is operating a number of gear-rolling machines on both spur and bevel gear work.

**Good Business in Texas**—More than 100 motor cars have been sold in Williamson county, Tex., during the past 2 months, making all told more than 700 cars now owned in the county. It is estimated that more than 400 cars will be sold in this county during 1913. Most of the purchasers are farmers.

**Gaining Foothold in Brazil**—Practically all cars purchased in Bahia, Brazil, during 1912 were of American manufacture. Previously the sales had been confined to European cars. The change was due to the fact that two large hardware firms imported a number of American cars. That the Bahia public thought them superior to European cars was evidenced by the early sale of all cars on hand. Larger stocks of 1913 cars are being laid in.

**Winnipeg Gets Show Building**—The Winnipeg Motor Trades Association has completed arrangements for the leasing of the new garage of the Canadian Motor Co., Winnipeg, for the holding of its third annual motor show. The available floor space in the building totals nearly 30,000 square feet and is free from obstructions such as posts, etc.

## From the Four Winds

**CLUB at Champaign, Ill.**—The Champaign County Automobile Club of Champaign, Ill., has been organized, Harry Herriek being chosen temporary chairman. As soon as 100 members are secured, articles of incorporation will be taken out.

**Looking After Traffic**—The National Association of Automobile Manufacturers has established a traffic office in Detroit in charge of J. A. Gardner, formerly traveling manager for the Brush and later with the Stoddard-Dayton, of Dayton, O. Some of the work of the New York office will be transferred and the local office will take up the matter of securing better transportation facilities for Detroit car manufacturers.

**To Continue Cannon Ball Trail.**—A meeting of good roads boosters was held at Galesburg, Ill., last week, representatives of towns between Galesburg and Quincy being present to consider the proposed continuance of the Cannon Ball trail from Quincy to Chicago via Galesburg. The route between Chicago and Kansas City is rapidly becoming a reality. At the latter city the trail connects with the transcontinental west to Denver, which is likely to be used in 1915 by tourists bound for the San Francisco exposition. The Cannon Ball trail is laid out from Kansas City to Quincy. The trail will follow the Burlington railway between Quincy and Chicago. Division No. 1 will

extend from Quincy to Macomb; division No. 2 from Macomb to Galesburg; No. 3 from Galesburg to Princeton; division No. 4 from Princeton to Aurora, and division No. 5 from Aurora to Chicago. There are no bad grades.

**Iowa Asks for Bond Issue**—The Iowa Good Roads Association at Des Moines has adopted a resolution asking the legislature to submit to the people a proposal to bond the state for \$25,000,000, with which to build roads in the state, connecting the county seats with paved highways, a total of 5,000 miles. The resolution favors a 1-mill tax for bond interest. It is suggested that the motor taxes be utilized to retire the bonds.

**Hoosiers Indorse Ordinance**—The Hoosier Motor Club has asked the advisory commission to Mayor Shank of Indianapolis to indorse a proposed ordinance forbidding motor cars to go around street cars on the left-hand side. The club will submit such an ordinance to the city council at an early date and will use its influence to have it passed. The habit of going around street cars on the left side is regarded by the club as a dangerous one.

**Laying Out New Trail**—The East St. Louis-Springfield-Chicago Trails Association has been organized. A series of meetings will be held to work up interest along the proposed hard road between Chicago and St. Louis. It has been estimated that such a road will cost \$3,500,000. The road running parallel to the Chicago & Alton railway is the shortest and most inexpensive route, due to the absence of grades and also because there are short stretches of hard roads at intervals between the two metropolitan cities which piece in with the proposed trunk line.

**Legal Clash Over Horns**—After all but passing an ordinance making it a misdemeanor to operate a siren or mechanical horn within the limits of Milwaukee, the common council has been advised by the city attorney that a municipality has no right to interfere with the state law, which provides that all motor vehicles be provided with a "suitable bell, horn or signal." The intent of the proposed ordinance was to prevent the use of siren horns such as used by the fire department and insurance patrols, but the law was so worded that all mechanical horns could be prohibited. The Milwaukee Automobile Club accordingly fought the ordinance and requested that the "sensible signal" law of Chicago, St. Louis, Baltimore and other cities be substituted. The objection found by the city attorney effectually kills the proposition and it is likely that the sensible signal law will be passed, as it will not interfere with the state law.



ILLUMINATED DIRECTORY USED IN PARIS SALON

ONE of the most valuable conveniences in the Paris salon was a system of electric lights to indicate the position of stands. On large boards near the main entrance a plan of the entire show had been prepared, and in the center of each stand marked on the plan a small electric lamp had been fitted. By the side of the board was a complete list of the firms exhibiting, with an electric light button immediately after the name. By pressing this button a red light was made to appear on the stand shown on the plan. As a rapid means of finding the location of any stand it was most valuable.





NE difficulty that is sometimes experienced with quick-detachable rims is in

the removal of the locking ring, before detaching the tire. The tool illustrated is a simple screw-jack which hooks on the edge of the rim. The screw being turned by a screwdriver, the clincher ring is forced inward to the position indicated by the broken lines when the locking ring will be left free and may be readily removed. At times difficulty is experienced in inserting the hook of the tool between the locking ring and the rim edge. A little prying with a screwdriver, however, will accomplish this the first time, after which a groove may be filed or sawed in the ring to permit the hook to be inserted. After the first time, this notch will enable the tool to be used with no preliminary prying. William M. Tobey, East Boston, Mass., is the maker.

#### The Motometer

One of the latest of original novelties on the 1913 market is the Motometer, made by the Motometer Co., Inc., New York, which is shown in Fig. 4. This device consists of a dial which is attached to the radiator cap. Its purpose is to indicate the condition of the cooling system. It can be read from the driver's seat. The instrument comprises a thermometer, in which a bright red fluid is the active element. The thermometer tube projects about an inch below the radiator cap in which it is installed and registers the temperature not of the water itself but of the air immediately above it.

The dial is composed of a metal ring, inclosing two crystals, a front and a rear one, the front silvered to facilitate the reading of the glass from the driver's position. The image of the red column is magnified by the mirror thus formed, while an opening in the silvering permits the light from the head-

light to shine through on the glass to facilitate night reading. The dial that is visible registers all temperatures from freezing to boiling, between which it is the object of the operator to maintain the temperature of his radiator. The need of water is shown by the rising of the red column, while the necessity for blanketing the engine, or of running it to heat the water, is shown by a falling thermometer. An additional advantage to its use is in the detection of motor irregularities, such as bad spark timing, rich mixture or disordered pump that would cause overheating of the engine. The instrument is manufactured by the Taylor Instrument Co.

#### Corubia Lamp Lighter

Similar in action to the familiar cigar lighter, the Corubia lamp lighter, Corubia Mfg. Co., New York, is offered as a substitute for matches in lighting motor car lamps. It consists of a brass bracket, which

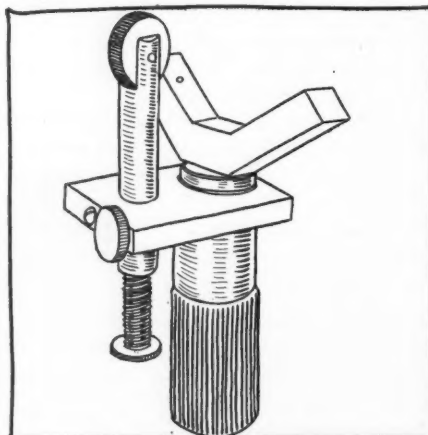


FIG. 3—CORUBIA LAMP LIGHTER

attaches permanently to the tip of the lamp and supports a brass pillar. This pillar is surmounted by a steel file wheel, which bears on a cylinder of sparking metal contained within the pillar. A spiral spring retains the sparking metal in contact, and is adjustable for tension by means of a small metal screw at the lower portion of the pillar. In use, the wheel is revolved with

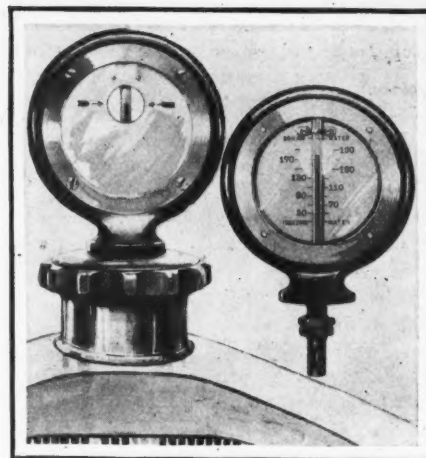


FIG. 4—MOTOMETER RADIATOR ATTACHMENT

the finger, the friction on the sparking metal causing a shower of sparks to play across the jets. It is said that each piece of sparking metal is sufficient for from one to three years of use. This device is shown in Fig. 3, as applied to the ordinary type of lava tip.

#### American Worm-Drive Axles

Despite the great progress which has been made during recent years in every branch of engineering knowledge, manufacturers of motor cars in this country have been slow to adopt the use of worm gearing. This is chiefly due to the fact that there always has been a general impression that all worm drives are inefficient as compared with chain or bevel gear drives. Recent tests conducted at the Daimler factory in England on the Lanchester-Daimler worm gear mechanism, which type of gearing is incorporated in a floating rear axle now manufactured in this country by the American Ball-Bearing Co., Cleveland, serve to show that this worm gearing is exceedingly efficient.

The Daimler Co. has published a facsimile reproduction of the National Physical Laboratory report of the tests, and the conclusion to be drawn therefrom is that the efficiency of the Lanchester-Daimler construction lies between 93 and 97 per cent, under all conditions of pressure, speed and temperature; taking the normal running speed of the worm at 1,000 revolutions per minute, the efficiency lies between 95 and 97 per cent, only falling slightly below the lower figure when the temperature approaches 100 degrees C.

The Lanchester worm is not a straight type, but is of the hourglass design, being formed so as to partially embrace the circumference of the worm wheel. The teeth of the wheel are also concaved to conform to the threads of the worm. Three teeth

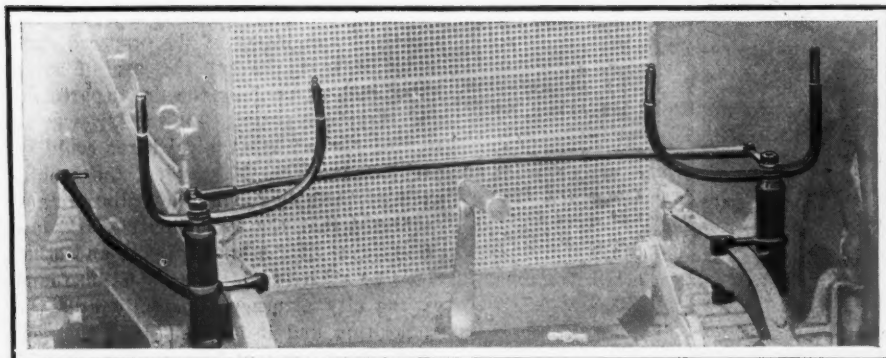


FIG. 2—RADIALITE LAMP BRACKETS

of the worm always share the load simultaneously, which is an advantage which this gearing has over the bevel type, only one tooth of which actually transmits power at any particular instant, the other teeth just coming into or leaving contact bearing an inappreciable share of the load. For this reason it is claimed that these worm gears are much stronger than bevels and can be subjected to considerable overload without risk of failure. Another important point is the claim that the wear which takes place on the worm teeth in the course of time does not in any way effect the efficiency of silent running of these gears.

There is a considerable difference of opinion among engineers as to the relative advantages of having the worm above or below the axle, and the American company therefore is prepared to furnish either construction. With the worm underneath, it runs constantly in a bath of oil, and as the question of proper lubrication has a very important bearing on the subject of worm drives, this underneath mounting has a slight advantage in that respect. It does, however, reduce the road clearance to about 9½ inches with 36-inch wheels, and increases the angle at



FIG. 5—DIFFERENTIAL, WORM, AND COVER OF AMERICAN WORM-DRIVE

the universal joint of the propeller shaft. Moreover, the overhead worm is well lubricated, as the worm wheel acts as a pump and carries sufficient oil up from the supply in the bottom of the housing.

For pleasure car work the manufacturers of this axle are supplying a pressed steel housing ⅜-inch thick of clean outward appearance. The entire driving mechanism, including the worm and worm wheel, together with the differential and all necessary bearings, is mounted on the gear-carrier and inserted in the axle as a unit. The drive shaft and differential are carried on large annular ball bearings and in each case provision is made for end thrust, which is much greater than in a bevel driven axle. Thrust bearings relieve the annulars of all except the radial load and hold the gears in correct alignment. A separate set of bearings also is provided to take thrust during the reverse

drive. The hubs are also mounted on annular ball bearings and are driven by means of clutch plates on the axle shafts. Double internal, or external and internal brakes are furnished, the outside one being adjustable, as shown in the photograph. In the floating axle construction the entire car weight rests upon the axle tubes which are made from 3½ per cent nickel steel and riveted into the ends of the pressed steel housing. The drive shaft and axle shafts are made from heat-treated chrome-vanadium steel, while the bevel gears in the differential are of 3½ per cent hardened nickel steel. Hubs are of cast steel with sheet steel flanges and brake drums.

The American concern is at present making these Lanchester-Daimler worm gear rear axles for trucks and electric vehicles, as well as for gasoline pleasure cars.

#### Crown Positive Gear-shift Lock

Simplicity is the characteristic feature of the Crown gear-shift segment lock. This lock, Fig. 6, consists of a plug shaped to fit the center gate of a standard H-plate gear-shift segment, inclosing the lever, so as to hold it in neutral position. It is locked by a padlock, through a hole in a lip extending through the segment, below the H-plate. As long as the padlock is in position, the lever cannot be moved from neutral position, thus effectually preventing the operation of the car, while in no wise hindering it from being pushed about the garage floor.

#### Winona Radialite Device

The Winona Radialite device, Fig. 2, consists of a pair of lamp brackets of ordinary appearance, which are substituted for the brackets with which the car is regularly supplied. These brackets are not bolted or riveted to the frame, but are merely clamped on. The posts are in the form of a hollow sleeve, integral with the clamp, and an upright, free to turn within the stationary sleeve, which supports the adjustable forks. One of the brackets has a single lever at the rear, and the other in addition to this has another lever which connects with the steering bell-crank lever. The other two levers are connected by a light tie-rod behind the lamps, so that as the bell-crank lever is moved in turning the lamps are revolved to face in the direction in which the car is turning. The

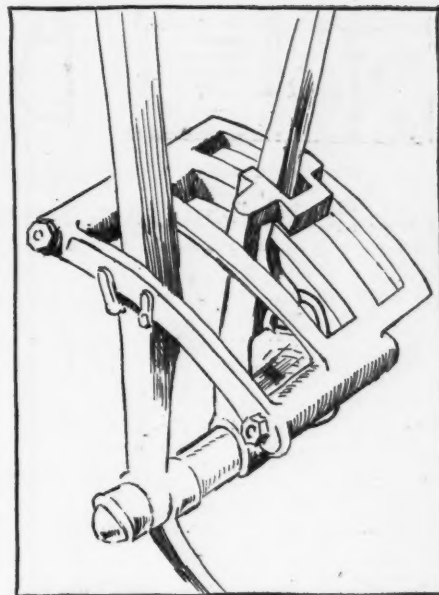


FIG. 6—CROWN GEARSHIFT LOCK

value of this device is in negotiating strange roads after dark, when a view of the road around the bend is much to be desired.

#### Error in Drawing

Fig. 7 shows a correct cross section of the suspension ball bearing, described in these columns December 12, 1912. In the drawing published in connection with this description, the curved races were not

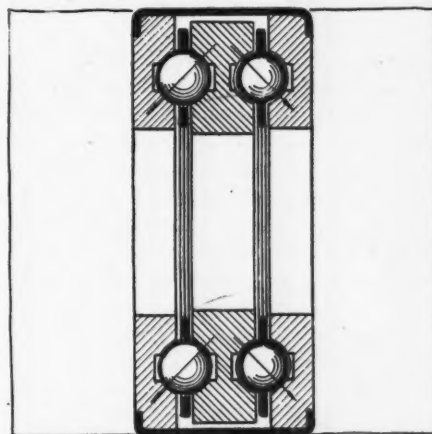


FIG. 7—CROSS-SECTION OF SUSPENSION BEARING

properly shown. The above drawing will correct any erroneous impression that may have been gained. The arrows show the angular support.

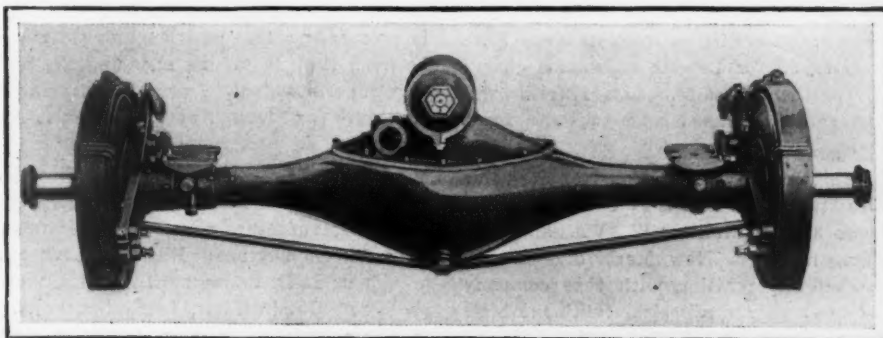


FIG. 8—AMERICAN BALL BEARING LANCHESTER-TYPE WORM-DRIVE AXLE





# Brief Business Announcements



## Agencies Appointed by Motor Car and Truck Manufacturers

PLEASURE CARS					
Town	Agent	Car	Town	Agent	Car
Baltimore, Md.	Shaffer Mfg. Co.	Pullman	New Orleans, La.	Automobile Maintenance Co.	Lozier
Baltimore, Md.	C. M. Shaffer	Selden	Oakland, Cal.	C. C. Eichelberger	R. C. H.
Bayfield, Wis.	William Bassett	Studebaker	Ozona, Tex.	Ozona Auto Co.	Cole
Birmingham, Ala.	H. F. Yarbrough	Pope-Hartford	Pasadena, Cal.	Lieber-Coryell Motor Car Co.	Cole
Canton, O.	Auto Service Co.	Moon	Passaic, N. J.	Nathaniel Finch	Lozier
Columbus, O.	Winton Sales & Repair Co.	Winton	Phillips, Wis.	Hunt Auto Sales Co.	Ford
Correctionville, Ia.	A. M. Rogers	Cole	Phillips, Wis.	Hunt Auto Sales Co.	National
Des Moines, Ia.	Bothne Motor Co.	Imperial	Phillips, Wis.	Hunt Auto Sales Co.	Cutting
Des Moines, Ia.	Bothne Motor Co.	Crow-Elkhart	Phillips, Wis.	Hunt Auto Sales Co.	Herreshoff
Des Moines, Ia.	Bothne Motor Co.	Royal	Phillips, Wis.	Hunt Auto Sales Co.	Little
Des Moines, Ia.	Capital City Carriage Co.	Richmond	Phillips, Wis.	Hunt Auto Sales Co.	Chevrolet
Dows, Ia.	C. W. Broeffle	Cole	Quincy, Ill.	Machinery & Motor Co.	Cole
Harrisburg, Ill.	Charles V. Parker	Moon	San Angelo, Tex.	Will R. Ede Co.	Cole
Humboldt, Tenn.	Lannon & Johnson	Cole	San Francisco, Cal.	A. E. Hunter Auto Co.	Paige-Detroit
Joplin, Mo.	Joplin Supply Co.	Moon	San Jose, Cal.	W. J. Benson	Flanders
Louisville, Ky.	G. Dunham & C. L. Anderson	Cole	Sherman, Tex.	Roberts Electric Co.	Cole
Macon, Mo.	Macon Garage Co.	Moon	Texarkana, Tex.	Paul Jones	Moon
Manhattan, Kan.	Golden Belt Auto Co.	Cole	Union Hill, N. J.	Union Automobile Co.	Lozier
Marcus, Ia.	Johnson, Petty & Johnson	Moon	Washington, Mo.	C. A. Krumsick	Moon
Mitchell, S. D.	Central Auto Supply Co.	Moon	Webster City, Ia.	Hansen & Tyler Auto Co.	Lozier
Montreal, Can.	Page Motor Car Sales Co.	Paige-Detroit	Winnipeg, Can.	Palace Garage	Cutting
Montreal, Can.	Grenier & Warrington	Pierce-Arrow	Winnipeg, Can.	Canadian Motor Co.	Chevrolet
Nashville, Tenn.	Union Motor Car Co.	Lozier	York, Pa.	Auto & Truck Sales Co.	Little

### TRUCKS

Baltimore, Md.	Detroit-Baltimore Co.	Gramm	Montreal, Que.	Ralph Careau	Stewart
Boston, Mass.	American-Marion Motor Co.	Bröwn	Montreal, Can.	Fairbanks-Morse Co.	Mack
Boston, Mass.	H. Ross Maddocks	Stewart	Pittsburgh, Pa.	Alco-Pittsburg Sales Co.	Stewart
Chicago	voltz Brothers	Stewart	San Francisco, Cal.	S. G. Chapman	Stewart
Hartford, Conn.	Capital City Auto Sales Co.	Stewart	Washington, D. C.	David S. Hendrick	Stewart

**ATLANTA, Ga.**—The southern branch of the Buick is just moving into its new Peachtree street building.

**Springfield, O.**—Frank B. Hutchinson, Jr., has been appointed advertising manager of the Kelly-Springfield Motor Truck Co., of Springfield.

**Cleveland, O.**—The Baker Motor Vehicle Co. has declared a stock dividend of \$200,000 to be distributed equally among stockholders and certain of the employees.

**Wilmington, Del.**—The Marshall-Mancill Auto Co. has been formed here and is preparing to establish a service station and agency for several cars at 617 Shipley street.

**Detroit, Mich.**—John A. Hayes, formerly connected with the sales department of the Lion Motor Car Co. and United States Motor Co., has been appointed special sales representative for the Abbott Motor Co.

**Detroit, Mich.**—Herbert Hughes, for the past 6 years with the Packard, has joined the sales organization of the Buick Motor Co. and will sail from New York January 22 for London to assume charge of continental sales. Mr. Hughes was manager of Packard sales in Paris for 2 years.

**New York**—W. M. Roberts, formerly sales manager for the Packers Motor Truck Co., Wheeling, W. Va., and also manager of its New York branch, has resigned his position with that company and has accepted a position with the Mais Motor Truck Co., Indianapolis, Ind., as general sales manager. Mr. Roberts will

have charge of the selling end of the Mais company and his headquarters from now on will be in Indianapolis.

**Detroit, Mich.**—L. B. Sanders has been appointed general sales manager of the Abbott Motor Co. to succeed W. T. Bush, who recently resigned.

**Chicopee Falls, Mass.**—The Fisk Rubber Co. of New York will open on February 1 at Winnipeg, Man., a branch house at 307 Fort street. R. Phillips will be in charge as local manager.

**Toledo, O.**—L. I. Stewart, for the past 2 years general purchasing agent for the Warner Mfg. Co. of Toledo, has become sales and advertising manager. W. L. Rowe succeeds him as purchasing agent.

**Chicago**—The Grand Rapids Motor Truck Co., Grand Rapids, Mich., maker of the Decatur, has opened a branch salesroom at 730 South Wabash avenue. James McKee is the branch manager.

**Detroit, Mich.**—The management of the Abbott Motor Co. has abolished the office of factory manager, the duties formerly attached to this position being divided between the general manager and the factory superintendent. George C. Shoemaker continues as factory superintendent in charge of all production.

**Louisville, Ky.**—The Speedway Tire Co. is being organized as a Delaware corporation to manufacture tires. The officers of the new company are: Harry L. Lewman, president; L. D. Lewman, of Atlanta, vice-president; Fred Haupt, Louisville, second vice-president; W. N. Cox, treasurer, and Dr. Fred L. Koontz, secretary. G. W.

Greene will have charge of the new plant. Two sites for the factory are now under consideration.

**Buffalo, N. Y.**—The International Acheson Graphite Co. of Niagara Falls, N. Y., has appointed Richard Cary sales manager of its lubricant department.

**Cleveland, O.**—R. S. Hartzell, formerly of the Detroit branch of the Goodyear Tire and Rubber Co., has been appointed manager of the Cleveland branch. Mr. Hartzell succeeds Mr. Hammerle, who has been promoted to the district office at Detroit.

**Minneapolis, Minn.**—The South Dakota Motor Car Co. has bought the interests of R. C. Bush in the Tyner Garage Co., Webster, S. D., the first step in establishing a series of houses in the state, with headquarters at Webster. The company will distribute the Detroit in the state.

**Buffalo, N. Y.**—The Dwell-Kaiser Co., manufacturer of paints, oil and varnishes, has purchased the Jewett building on Elm street for \$85,000. The seven-story building will be converted into a modern plant. Laurens A. Enos, president of the American Automobile Association, is president of the Dwell-Kaiser Co.

**Toledo, O.**—The latest project of the Willys-Overland Co. here is the erection of an exhibition building, which will cost over \$40,000, which is to be located at Madison avenue and Twenty-second street. The building will be one story in height and will be constructed of pressed brick. Ornamental terra cotta will be used in the wall facings and the interior will be

artistically decorated. The entire floor of the exhibition room will be laid in mosaic tile.

**Baltimore, Md.**—The Marathon Sales Co. has opened up new salesrooms at 1708 North Charles street.

**Vancouver, B. C.**—The O'Brien & Struthers Co. has opened up at 810 Georgia street, and will handle the Miller tire.

**Louisville, Ky.**—The Memphis Shock Absorber Co. has entered the local field, with a salesroom at 917 South Third street.

**Detroit, Mich.**—R. N. Mosher has been chosen to head the Olds agency in Detroit. Mr. Mosher formerly represented the company at Dallas, Tex.

**Ottawa, Ont.**—The MacLeod garage has been taken over and is now being operated under the management of Thomas Baird and Sydney Clemens. The firm will henceforth be known as the Dominion garage, handling the Case.

**Baltimore, Md.**—Federal tires are being handled in this locality by the Federal Tire Sales Co. with salesrooms in the Motor Car Co. building, Mt. Royal and Maryland avenues. Clarence A. C. Browning is president and Harry A. Mayer secretary of the company.

**Minneapolis, Minn.**—The northwestern branch for the Oakland Motor Co., Pontiac, Mich., has been incorporated as the Northwestern Oakland Motor Co., with \$100,000 capital. J. W. Martin, St. Paul, is president; H. T. Trow, Minneapolis, is vice-president, and A. N. Smith, Minneapolis, is secretary and treasurer. The

company's headquarters are in a new building at 1518 Hennepin avenue.

**Detroit, Mich.**—A Detroit branch has been opened by the Eisenmann Magneto Co. at 802 Woodward avenue.

**Boston, Mass.**—Walter Clapp, who handles the Simplex, has moved into new quarters at 1008 Commonwealth avenue.

**Vancouver, B. C.**—The Pacific Coast Auto and Transportation Co., Ltd., is located at its new fireproof garage at 1258 Hornby street.

**York, Pa.**—The R. & R. Garage and Supply Co., successor to the Miller garage, 308 West Market street, has been organized. The company will handle the Michigan.

**Philadelphia, Pa.**—At an expenditure of more than \$150,000 the colony of dealers that have gradually withdrawn from that section of North Broad street popularly known as the row and settled on Market and Chestnut streets immediately east of the Schuylkill river is to have a handsome addition to its ranks in the form of a large concrete fireproof building at Twenty-third and Chestnut streets, which will be erected by Kahn & Greenburg, owners. The new building will be three stories high, occupying a lot with a frontage of 174 feet on Chestnut street, 190 feet on Ionic street and 47 feet on Twenty-third street, with a depth of 97 feet, and will in turn be subdivided into three structures especially adapted for motor car sales and service purposes, each with a Chestnut street frontage of 58 feet. The westernmost structure of the proposed

building has already been leased to the Eldredge Co., Philadelphia distributor of the Garford truck.

**Toledo, O.**—The McNaul Auto Tire Co. has moved into a three-story brick building on Superior street.

**Boston, Mass.**—J. L. Judd, who has the Jackson in Boston, has opened a new service station in Cambridge.

**Galesburg, Ill.**—The Cadillac Automobile Co. of Peoria has opened a sales agency here with John R. Oakes as manager.

**Boston, Mass.**—The Easton Machine Co., maker of the Morse car, has moved the Boston branch from Hereford street to 1000 Commonwealth avenue.

**Prairie du Sac, Wis.**—The Prairie du Sac Auto Co. has purchased the Koch building near its garage and will use it for repairs and dead storage.

**Washington, D. C.**—J. J. Bartram has been appointed agent for the Rauch & Lang electric. He conducts a large electric garage on New Hampshire avenue.

**San Francisco, Cal.**—S. A. Moss has been elected president of the Pacific Motor Car Co., northern California distributor of the Stevens-Duryea, Cole and Woods electric. Colonel A. W. Bradbury remains general manager.

**Toledo, O.**—M. E. Humbarger, formerly manager of the Collingwood garage, has sold out his interest in that firm and opened a repair shop and salesrooms at the rear of 238 Erie street. Mr. Humbarger is distributing agent for the Apperson cars for northwestern Ohio.

**Aroville, Cal.**—Gridley Garage Co., capital stock, \$5,000; incorporators, W. A. Swain, W. S. Simpson.

**Augusta, Me.**—Capital Engine Co., capital stock, \$1,000,000; to manufacture motors; incorporators, E. M. Leavitt, E. L. McLean.

**Boston, Mass.**—Republic Rubber Co. of Massachusetts, capital stock, \$5,000; to manufacture tires; incorporators, E. M. Churchill, N. J. MacGaffin, C. R. Yeaton.

**Boston, Mass.**—Donovan Motor Car Co., capital stock, \$50,000; incorporators, J. S. Donovan, A. D. Adams, G. E. Donovan.

**Boston, Mass.**—Pope Mfg. Co., capital stock, \$6,500,000; incorporators, A. L. Pope, G. Pope, R. P. Clapp.

**Buffalo, N. Y.**—F. A. M. Auto Supply Co., capital stock, \$20,000; incorporators, F. A. Marburg, J. B. Green, R. H. Templeton.

**Bridgeport, O.**—Bridgeport Auto Co., capital stock, \$5,000; incorporators, J. B. Handlan, W. G. Hamilton, W. G. Knote.

**Brooklyn**—Hoyt Garage, capital stock, \$1,000; incorporators, L. C. Brooks, W. J. Kelly, C. Blaken.

**Brooklyn, N. Y.**—Pratt-Hendricks Co., capital stock, \$1,000; general motor car business; incorporators, W. H. Pratt, W. J. Hendricks, Jr., G. L. Robinson.

**Chicago**—American Motor League, capital stock, \$2,500; to manufacture and deal in motor cars and accessories; incorporators, J. C. Garriott, Jr., G. T. Carver, M. L. Felkey.

**Chicago**—Broc Electric Vehicle Co., capital stock, \$12,000; general garage and motor car business; incorporators, S. N. Cotterman, T. C. Lyons, S. M. Corbett.

**Chattanooga, Tenn.**—Chaplin-Dille Motor Car Co., capital stock, \$25,000; to manufacture and deal in motor cars; incorporators, B. M. Chaplin and others.

**Cleveland, O.**—Alco Motor Co., capital stock, \$10,000; incorporators, M. Kluger and others.

**Norwich, Conn.**—Uncas Garage Co., capital stock, \$2,000; incorporators, A. C. Brown, W. H. Yeomans, E. E. Williams.

**Wilmington, Del.**—Universal Motor Truck Co., capital stock, \$1,200,000; incorporators, H. E. Latter and others.

## Recent Incorporations

**Elyria, O.**—J. & H. Taxicab Co., capital stock, \$2,500; incorporators, A. L. Jackson, M. F. Harrison, C. Jackson, M. B. Harrison, L. B. Fauver.

**Indianapolis, Ind.**—Wizard Motor Co., capital stock, \$50,000.

**Jamestown, N. Y.**—Peterman Garage Co., capital stock, \$5,000; incorporators, A. Peterman, O. G. Peterman, M. S. Peterman.

**Jersey City, N. J.**—National Welding Co., capital stock, \$25,000; to conduct motor car business; incorporators, E. P. Hoyt, S. H. Culver, L. W. Phillips.

**Kansas City, Mo.**—Hanna Motor Mfg. Co., capital stock, \$60,000; to manufacture motors; incorporators, J. M. Frank, R. J. Hanna.

**Louisville, Ky.**—Standard Auto Co., capital stock, \$25,000; to deal in motor cars; incorporators, G. A. Dunham, C. L. Alderson, J. H. Alderson.

**Lowell, Mass.**—Ruggles Motor Sales & Repair Co., capital stock, \$3,000; incorporators, F. W. Colburn, W. A. Parkhurst, A. R. Ruggles.

**New Haven, Conn.**—Motor Truck Sales Co., capital stock, \$10,000; incorporators, J. F. Denison, J. F. Mabry, H. W. Beach.

**New York**—Gas Saver Sales Co., capital stock, \$25,000; to manufacture device for economizing on gasoline consumption in motor cars; incorporators, H. C. Fisher, J. H. Miller, E. Cable.

**New York**—Auto Buyers' Co. of America, capital stock, \$1,000; motor car business; incorporators, J. Lichtenstein, J. P. Maclellan, A. K. Hill.

**New York**—Frank M. Randall Mfg. Corp., capital stock, \$5,000; to manufacture motors; incorporators, F. M. Randall, P. K. Stern, L. B. Rosenberg, J. C. Weschler.

**New York**—Miller Tire Sales Co., capital stock, \$5,000; incorporators, H. C. Miller, H. C. Mills, W. A. Schenck.

**New York**—Co-operative Used Car Co., capital stock, \$3,000; to deal in used cars; incorporators, J. B. Bauer, L. Ezechiel, J. Curtis.

**Newark, N. J.**—I. H. C. Motor Express Co., capital stock, \$25,000; express and transportation business; incorporators, J. B. Furber, M. F. O'Neill, H. C. Herman.

**Newark, N. J.**—Universal Motor Truck Co., capital stock, \$50,000; to deal in motor trucks; incorporators, J. Kramer, G. Cleveland, P. Maun.

**Painesville, O.**—Vulcan Mfg. Co., capital stock, \$300,000; to manufacture motor cars; incorporators, E. Heartwell, E. H. Murray, J. C. Ward, W. Truby, H. E. Hammer.

**Philadelphia, Pa.**—Durable Tread & Automobile Sales Co., capital stock, \$10,000; to deal in tires and accessories; incorporators, R. H. Pacobi, S. M. Winkler, H. A. Deimel.

**Pineville, Ky.**—Cumberland Motor Co., capital stock, \$50,000; to manufacture spring motors.

**Pittsburgh, Pa.**—Keystone Motor Supply Co., capital stock, \$12,000; to manufacture and deal in motor cars; incorporators, E. H. Biedringhas, C. H. McDonald, R. V. Campbell.

**Portland, Me.**—Apperson Automobile Co., capital stock, \$10,000; incorporators, A. L. Edgcomb, G. W. Merrow, E. H. Wilson.

**Quincy, Ill.**—Machinery & Motor Co., capital stock, \$25,000; incorporators, B. Kinsey, F. H. Wilms, H. V. C. Tingley.

**Trenton, N. J.**—Empire Rubber & Tire Co., capital stock, \$1,000,000; incorporators, C. H. Baker and others.

**Wilmington, Del.**—Speedway Tyre Co., capital stock, \$250,000; incorporator, H. L. Lewman.

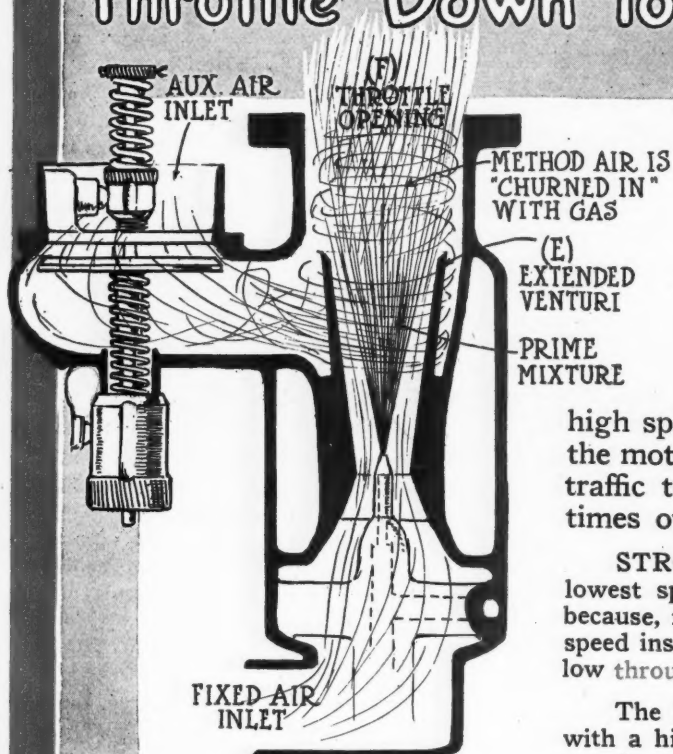
**East Orange, N. J.**—Rickey Machine Co., capital stock, \$125,000; general motor car business; incorporators, C. A. Hauswirth, M. H. Rickey, F. A. Nott, Jr.

**Worcester, Mass.**—Frank D. Judson Co., capital stock, \$7,000; motor car business; incorporators, C. F. Jackson, F. D. Judson, A. E. Johnson.



# WHY STROMBERG

## Throttle Down to Lowest Speed on



The trouble with the ordinary carburetor is inflexibility—that is, if it is adjusted to throttle down economically to low speed, at high speed it delivers a feeble mixture which takes all the “whip” out of a motor. On the other hand, if it is properly adjusted to deliver a well-proportioned mixture at high speeds, it falls down on low speeds by “loading” the motor and wasting enough gas running in crowded traffic to pay for an *Improved STROMBERG* many times over.

*STROMBERG Improved* Carburetors throttle down to lowest speeds on high gear, yet never waste a drop of fuel, because, figuratively, they combine 2 carburetors in one—a low speed instrument and an instrument for every other speed from low through high.

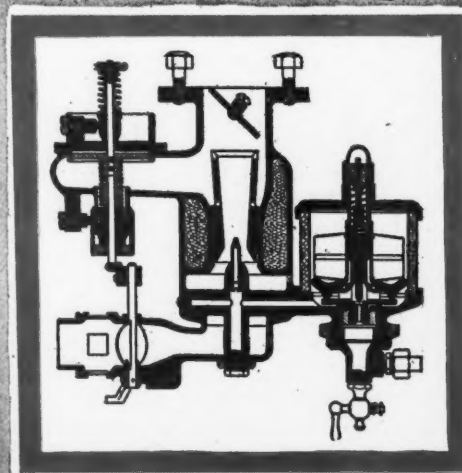
The *STROMBERG* at low speed should not be confused with a high speed carburetor struggling to adapt itself to low speed conditions. It operates at low speeds absolutely independent of its high speed adjustments (see diagram on right hand page). And the beauty of it all is that *STROMBERG Improved* Carburetors at low speeds work automatically. No mechanical connections, as in other carburetors, are required to get results.

Let us explain to you “Reasons Why.” In every *STROMBERG Improved* Carburetor there are 2 springs—a light tension low speed spring (A), and a relatively stiff high speed spring (B). The low speed spring acts independent of the high speed spring. It is a mechanical impossibility for the latter to be brought into play at any speeds other than intermediate and high.

The low speed spring, being delicate in tension, is responsive to the slightest motor suction. The result is that on high gear at low speed it admits more air and less gas than is possible to any carburetor which combines both high and low speed adjustments in one unit—one spring—or in a spray nozzle needle operated by opening and closing the throttle. The *STROMBERG* spray nozzle is not mechanically affected in any manner by the throttle opening.

The *STROMBERG* therefore admits a perfectly proportioned low speed mixture, solely adapted to low speed work, not a high speed mixture bullied into service as a makeshift at low speed. This just-right *STROMBERG* mixture makes for maximum fuel economy. At low speed every gasoline globule gives full account of itself in the motor.

SECTIONAL VIEW—TYPE A



# CARBURETORS

## High Gear Yet Maintain Economy

Why is every drop of gasoline utilized in **STROMBERG Improved Carburetors**? Because of the extended venturi (see left-hand diagram).

Every motorist knows that an egg-nogg is composed primarily of eggs and milk in proper proportions. The two do not make a real egg-nogg till they have been thoroughly mixed. Every motorist knows that a motor "charge" is made up of gasoline and air in proper proportions. The two do not make a real "charge" till they have been thoroughly mixed. What a "shaker" is to an egg-nogg the **STROMBERG** extended venturi is to a perfect mixture. Both serve to combine distinctly separate components into a thoroughly homogeneous whole.

But how? The **STROMBERG** extended venturi (E) reaches as near to the throttle opening (F) as possible. Unlike ordinary carburetors, the velocity of the regular air charged with gas from the spray nozzle does not slacken in its course through the mixing chamber. No gasoline can precipitate.

The auxiliary air whirls around the outer walls of the extended venturi, cyclone-wise (see illustration). It "boosts" the regular air, does not "buck" it. It becomes thoroughly "sifted" or "shaken in" with the prime mixture. The result is a thoroughly homogeneous mixture shot directly through the throttle opening into the manifold and motor.

This is but another economy reason **STROMBERG Improved Carburetors** throttle down to lowest speed on high gear.

To motorists who have to "snail" through crowded traffic, the above **STROMBERG** features carry a meaning distinctly their own—no more running on low gear, no more heated engines, vibration, discomfort, money burned up in wasted gasoline.

Next week will appear "WHY **STROMBERG IMPROVED CARBURETORS** ARE EASIEST TO ADJUST, AND STAY ADJUSTED. Your address on the back of a post card will bring you all "Reason Why" Talks issued to date.

### "Reason Why" Talk—4

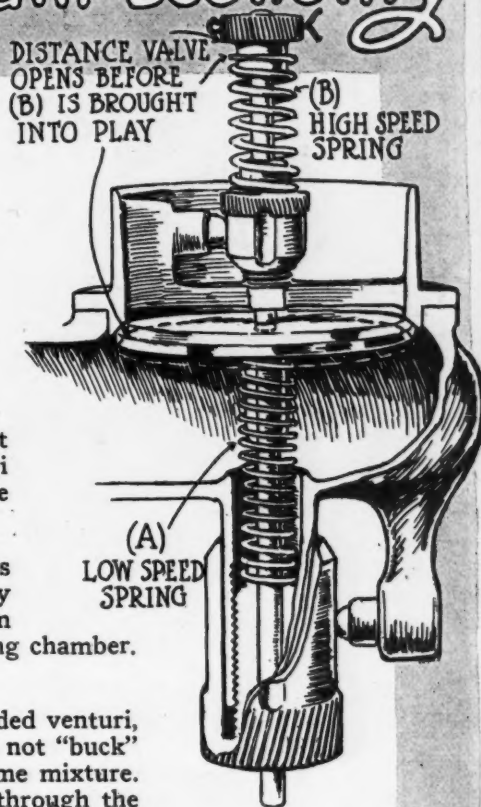
Look for our exhibit at the New York Show (Madison Square Garden Balcony, space 210) and at Chicago

## STROMBERG MOTOR DEVICES COMPANY

100 East 25th Street, Chicago, Illinois

### BRANCHES:

New York	Boston	Detroit	Indianapolis
Minneapolis		San Francisco	



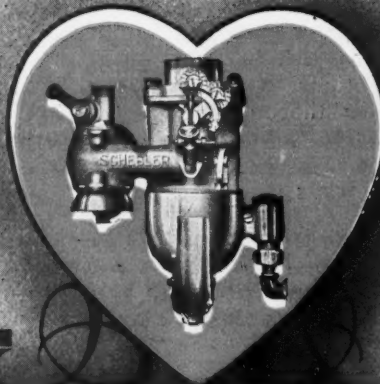
TYPE A





# SCHEBLER

*The Aristocrat  
of Carburetors*



*"The Heart of the Automobile"*

## WHEELER & SCHEBLER

*"Pioneers in Perfection" of Carburetion*

MANUFACTURERS  
INDIANAPOLIS U.S.A.

### THE SCHEBLER IS THE ACKNOWLEDGED STANDARD CARBURETOR OF THE WORLD

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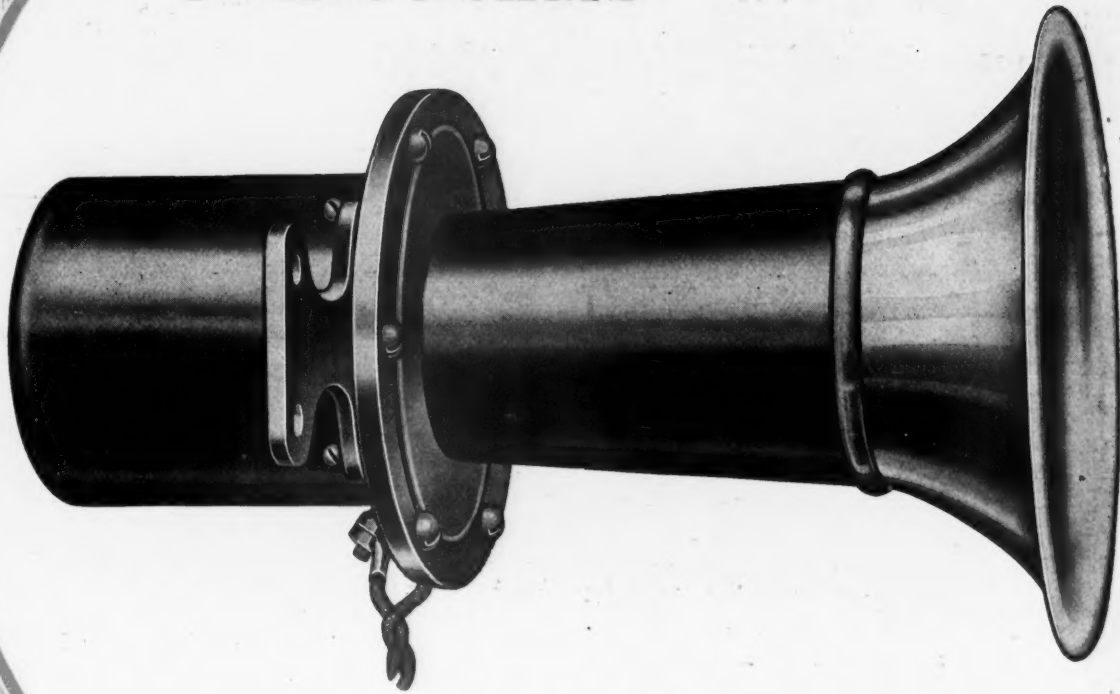
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Every city and town in  
the United States and  
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The  
**KLAXET**  
Twelve Dollars



18,500 Klaxets sold  
in 3 months



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Lovell-McConnell Mfg Company Newark, N.J., U.S.A.

**KLAXON**

*"The Public Safety Signal"*



KLAXON

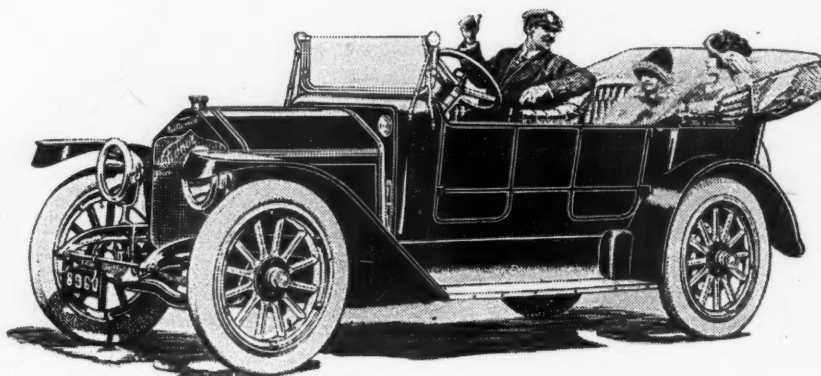
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*Stock Champion**International Champion*

# National 40

Improved Series V \$2750 to \$3400 Five Models



## A Work of Art

ARTISTS add rare beauty and luxury to your National car after the mechanical engineering experts have perfected its power, reliability, ease of control, and serviceable qualities.

For luxury and utility you find the National the criterion.

Long stroke motor (4 $\frac{3}{8}$ x6), left-side drive, center control, Gray & Davis electric starter, Gray & Davis dynamo electric lighting system, Bosch double dual magneto, multiple jet carburetor, 12-inch Turkish upholstery, tire pump integral part of motor, 128-inch wheelbase, Hoffecker speedometer, full floating rear axle, concealed baggage compartments, tire carriers, full heavy nickel trimmings, powerful brakes, perfect oiling system, robe rail, foot rest, foot mat in running board, concealed tool box, electric horn, top, curtains, Truffault-Hartford Shock Absorbers in rear, adjustable ventilating and rain vision windshield and one extra Firestone demountable rim.

Photographic reproductions will be mailed to you upon request

**National Motor Vehicle Company, Indianapolis, Indiana**

# DON'T DO IT

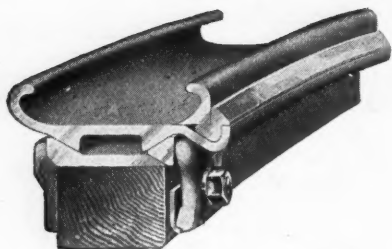


CLBA

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**Practical—  
Economical—  
The Regular  
Equipment  
For  
High Grade  
Cars**



**Type A Rim for Clincher Tires.**  
Strong, Light, Durable



**Type B Rim. Reversible for  
Clincher or Straight Side.**

**I**T'S because they have tested them and found them the *only* rims worthy—because they have discovered they *add worth and selling value* to their product—that high grade car builders are adopting, as their regular equipment,

# Firestone

**Quick Detachable  
Demountable Rims**

**For All Types of Tires—Clincher or Straight Side**

**Worthy, Because Simple.** No complicated mechanism to interfere with ease and speed—no parts to rust together. Demounted with an ordinary wrench. Tires detached, while rim is on wheel if desired, with any flat, thin tool. In repeated punctures a most valuable refinement.

**Worthy, Because Safe.** Firestone valve sleeve holds valve and spreader securely in place—deflated tires cannot be thrown.

**Worthy, Because Tire Protecting.** The no-split base prevents moisture seeping in to ruin casing or inner tube.

**Worthy, Because Economical.** The wedge-shaped clamping ring keeps rim in true; gives perfect tire seating; prevents uneven wear.

**The Firestone Tire & Rubber Co.**

**"America's Largest Exclusive Tire and Rim Makers"**

**Akron, Ohio**

**All Principal Cities**

**Equip Your Cars with the Rims Which Have "Made Good." Get  
Demountable Rim Book and Learn the Facts.**

# HOLLEY

## CARBURETOR

**Here's the Best Carburetor I Can Buy—  
the one everybody is talking about**

—the new Self-adjusting Holley, the carburetor with no moving parts and only one adjustment.

Particularly efficient in winter because it is equipped with temperature regulator.

First cost slightly more than that of any other carburetor, but increased horsepower results, and great economy more than offset increased cost.

Will pay for itself in 5000 miles.

Springs, cams, balls and other sensitive and unreliable, old-fashioned devices have been eliminated.

It is two years ahead.

Other makers are beginning to copy it. 140,000 cars equipped with it during the past sixteen months.

Manufacturers are adopting it as fast as their contracts with other makers expire. Used by 16 car makers now.

Sold on a "thirty-days'-free-trial-money-refunded" basis.

It's guaranteed to increase your car's efficiency. Try it.

Send for literature.

**Holley Brothers Company**

131 Rowena Street Detroit, Michigan

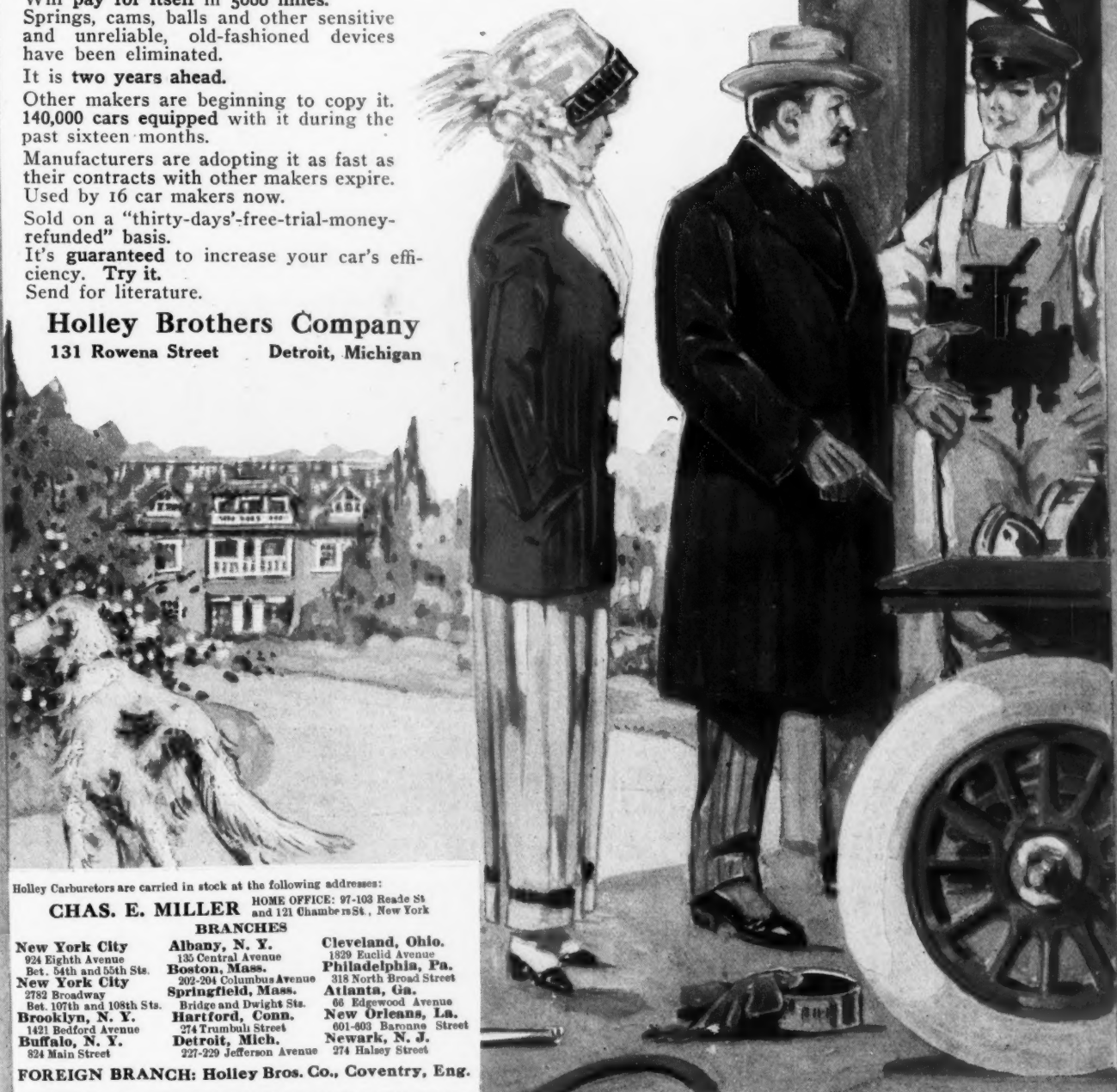
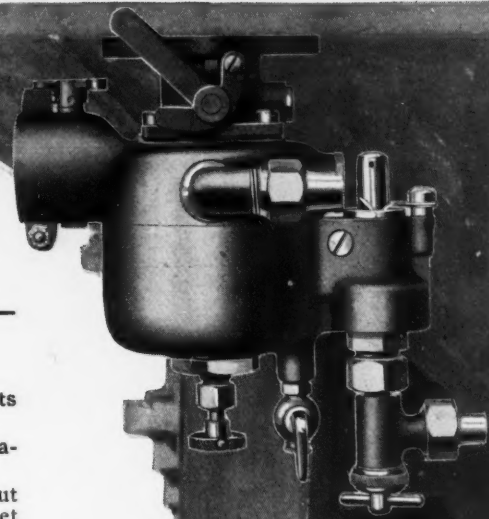
Holley Carburetors are carried in stock at the following addresses:

**CHAS. E. MILLER** HOME OFFICE: 97-103 Reade St.  
and 121 Chambers St., New York

### BRANCHES

<b>New York City</b> 924 Eighth Avenue Bet. 54th and 55th Sts.	<b>Albany, N. Y.</b> 135 Central Avenue	<b>Cleveland, Ohio.</b> 1529 Euclid Avenue
<b>New York City</b> 2732 Broadway Bet. 107th and 108th Sts.	<b>Boston, Mass.</b> 202-204 Columbus Avenue	<b>Philadelphia, Pa.</b> 318 North Broad Street
<b>Brooklyn, N. Y.</b> 1421 Bedford Avenue	<b>Springfield, Mass.</b> Bridge and Dwight Sts.	<b>Atlanta, Ga.</b> 66 Edgewood Avenue
<b>Buffalo, N. Y.</b> 824 Main Street	<b>Hartford, Conn.</b> 274 Trumbull Street	<b>New Orleans, La.</b> 601-603 Baronne Street
	<b>Detroit, Mich.</b> 227-229 Jefferson Avenue	<b>Newark, N. J.</b> 274 Halsey Street

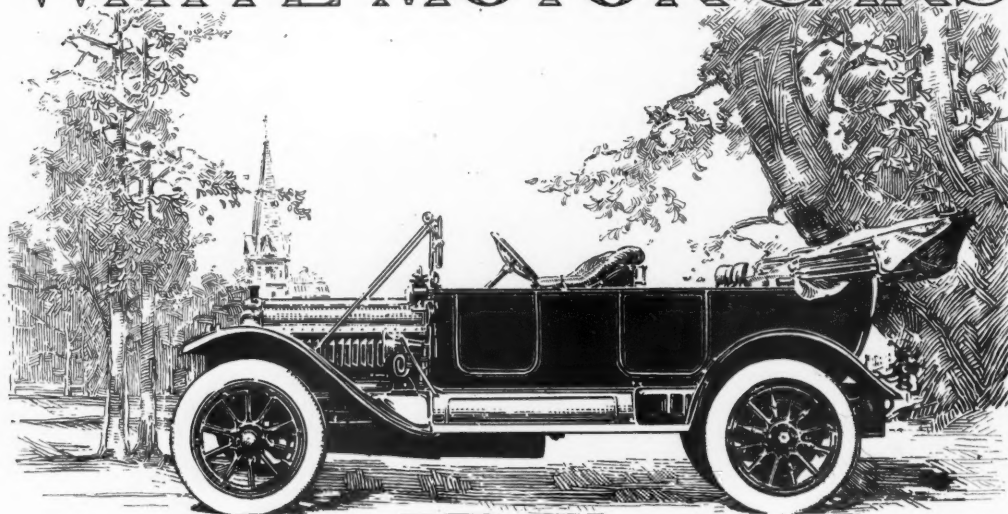
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# INCOMPARABLE WHITE MOTOR CARS



*Electrically started and lighted  
left side drive-right hand control*

**E**conomy of operation is essential in the motor car of to-day. Low fuel consumption, however was a myth until The White Company introduced to America the principles of economy embodied in the small bore, long stroke, monobloc motor.

This type of gasoline engine, now universally recognized as the most economical and desirable design, has been brought to its greatest efficiency in WHITE CARS.

For this reason, WHITE CARS are really economical in operation, more so than any other cars of equal size and power.

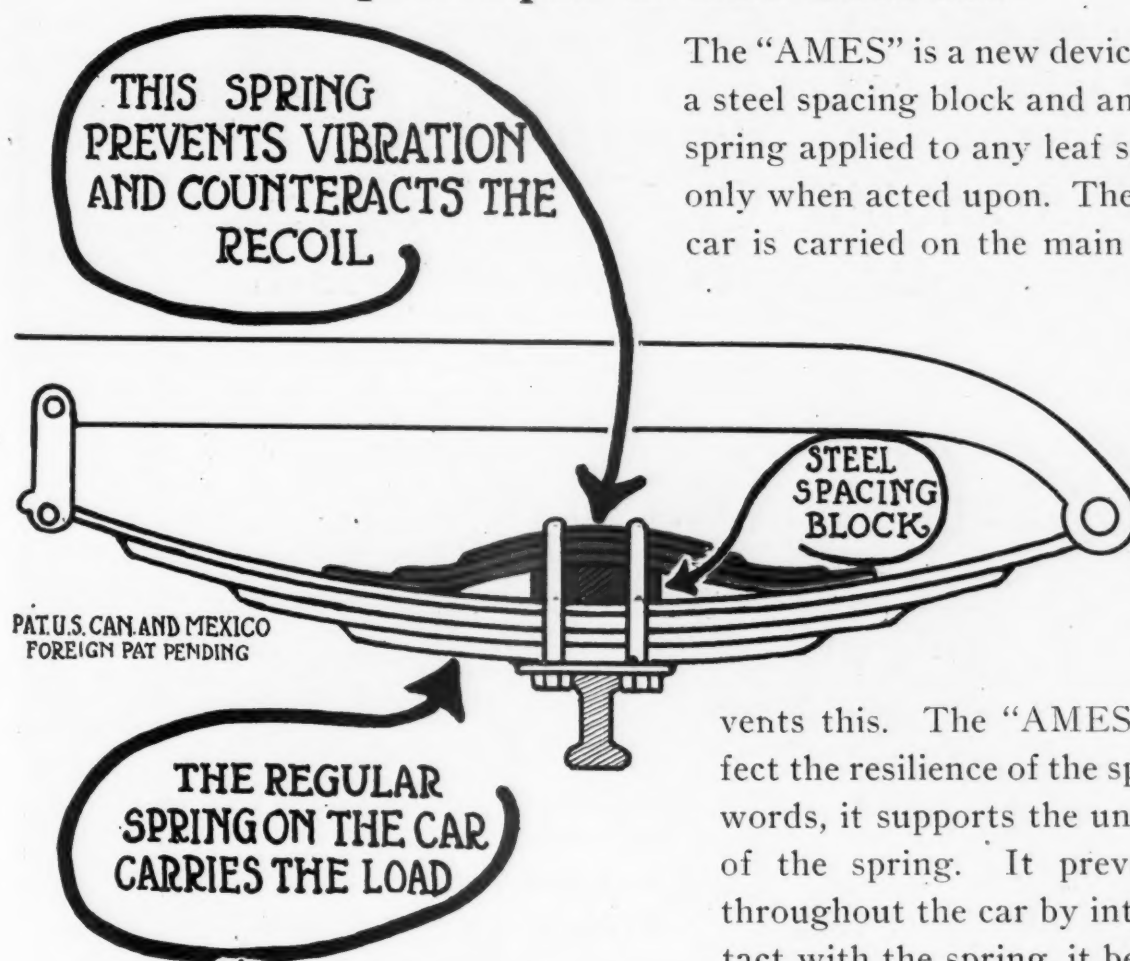
THE WHITE  COMPANY

Cleveland

# THE SHOCK ABSORBER YOU'VE BEEN LOOKING FOR— THE "AMES" AUTOMATIC

## *The Logical Kind*

Ask an Engineer or the Car-Wise Owner if this principle is not correct



The "AMES" is a new device consisting of a steel spacing block and an inverted steel spring applied to any leaf spring. It acts only when acted upon. The weight of the car is carried on the main spring, which

takes the thrust one way. But the spring must recoil. Most springs are broken on the recoil. The "AMES" pre-

vents this. The "AMES" does not affect the resilience of the spring. In other words, it supports the unsupported side of the spring. It prevents vibration throughout the car by intermittent contact with the spring, it being active and

passive automatically as road conditions demand. It is applied where the vibration originates. Adjustment is made in the height of the block at time of application. Once adjusted always ready.

A Set Consists of Four Absorbers, Spacing Blocks and Clips—Price \$45.00 and \$60.00 per set. Specify "AMES" on Your New Car



*See Our Exhibit at the Shows*

## CLARENCE N. PEACOCK & COMPANY

(EXCLUSIVE LICENSEES)

1784 BROADWAY, NEW YORK

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# Hotel Cumberland

*Broadway at 54th Street, New York*

OFFICIAL HOTEL:

Automobile Club of America  
America Automobile Ass'n



Near 50th Street  
Subway Station  
53d St. Elevated  
and all Surface  
Lines

"Broadway" Car  
from Grand Central  
Depot  
Seventh Avenue  
Car from  
Pennsylvania  
Station Convenient  
to Both Shows

**NEW AND FIREPROOF**

**STRICTLY FIRST CLASS**

*Rates Reasonable—\$2.50 With Bath, and Up  
Excellent Restaurant—Moderate Prices*

**TEN MINUTES' WALK TO 30 THEATRES**

*Send for Booklet*

**HARRY P. STIMSON** *Formerly with Hotel Imperial*

# RAYFIELD

## CARBURETORS

**Will be exhibited at all the  
Automobile Shows this season**

During your attendance at the Show investigate the RAYFIELD Carburetor — look carefully into its construction — you will *learn why* it has become famous in such a short time.

You will *learn why* it won the Grand Prix, the Vanderbilt Cup two years in succession, the Savannah Trophy — every other leading 1912 race event throughout the country — why it holds more **WORLD'S RECORDS** than all other carburetors **COMBINED!**

You will also *learn why* the RAYFIELD is not only the carburetor for greatest speed, but also for highest **ECONOMY** and **EFFICIENCY**. **WINTER OR SUMMER, RAIN OR SHINE, HIGH OR LOW ALTITUDE**, the RAYFIELD **PROVES ITS SUPERIORITY**.

At New York, Chicago and other Shows, our most competent men will be in attendance.

What they tell you, and what they show you, will surely be interesting and profitable to everyone interested in **PERFECT CARBURETION**.

You are invited to call and receive all necessary information.

**New York Show—January 11-25    Chicago Show—February 1-15**

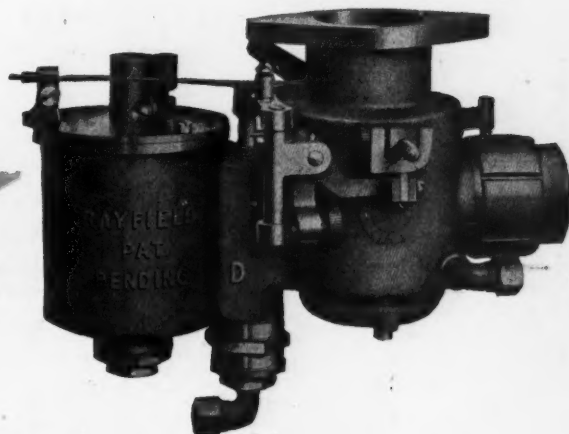
**CONCERT HALL  
MADISON SQUARE GARDEN  
SPACE 311**

**COLISEUM ANNEX  
SPACES 114-116**

**FINDEISEN & KROPF MFG. COMPANY**  
**21st and Rockwell Sts., CHICAGO, ILLINOIS**

**BRANCHES:**  
1140 MICHIGAN AVE., CHICAGO    907 WOODWARD AVE., DETROIT, MICH.  
NEW YORK CITY  
DISTRIBUTORS IN ALL LEADING CITIES

*When Writing to Advertisers, Please Mention Motor Age.*



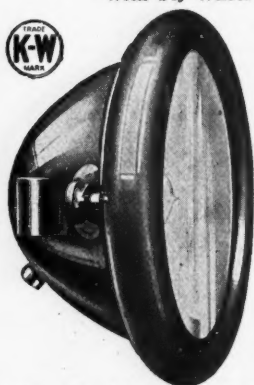


The  
New



# ELECTRIC HEAD LIGHT OUTFIT \$35.00

## Complete Electric Headlights FOR FORD CARS \$15.00 With Fly-Wheel Magneto



The successor to the gas tank. Current direct from Magneto. The K-W Outfits manufactured for this purpose are not makeshifts, but are complete in every detail.

The Outfit Complete, which is all you need, consists of

1 pair complete Head Lamps.  
2 Tungsten bulbs, 2-1/16" in diameter.  
12 feet wire, all soldered to lamps.

1 Lighting Switch.  
Instruction Sheet for Wiring.

The Lamps are made entirely of one piece of brass drawn from steel dies; have no soldered joints, easy to polish, and make a handsome lamp for the Ford cars. They fit the forks furnished on the Ford cars.

For Black finish add \$1.00.

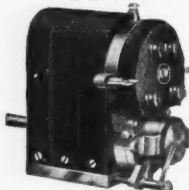
The chief value in an Electric Head Lamp is a perfect reflector. The K-W Reflector is a reflecting lens, optically figured out by one of the foremost optical and lighting engineers of the country, after a long series of experiments. Let us send you booklet explaining why the K-W Reflector excels all others.

## The K-W High-Tension Magneto

For all cars having provision for Magneto

Model J  
Guaranteed  
to Start  
Auto  
Engines up  
to 30 H. P.

We make larger  
Magneto for  
larger engines.  
High Tension  
Magneto are for Ignition use  
only. Use Low Tension for  
lights.



No Coil  
No Timer  
No  
Batteries  
4 Cyl., \$50  
6 Cyl., \$55

If you cannot  
gear-drive a  
High-Tension  
Magneto, use one  
of our Low Tension belt or  
friction-drive Magneto and  
a K-W Spark Coil.

Complete Outfit; alternating current generator, headlamps, switch, wire and bulbs.

Easy to install on any car with exposed fly-wheel. No storage battery required. No complicated cut-out nor charging device.

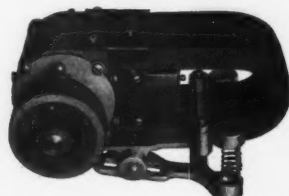
## CURRENT DIRECT FROM GENERATOR.

Weight only 18 lbs. Compare this with the heavy, complicated and costly charging outfits.

This Generator embodies the well-known K-W construction, having no commutator, no brushes, and no sliding contacts, the only moving part being the rotor, which swings perfectly free, supported on high duty ball bearings.

The Model LS K-W Generator has one magnet less than our regular Model UL \$35.00 Magneto, and is just like it in every way except that the Model LS is slightly smaller. Model LS will light two 2 1/2-Ampere bulbs (two sixteen candle power bulbs).

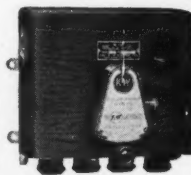
FOR IGNITION.—This Generator can be used in place of batteries for ignition if you have timer and spark coil.



The New Model LS Lighting Generator, \$20.00.

## The K-W Spark Coil

Single Cylinder .....\$12.00  
2-Cylinder ..... 18.00  
4-Cylinder ..... 30.00  
6-Cylinder ..... 42.00  
Marine Coils.....\$6.00 and \$7.00



32,000 FORD OWNERS NOW USE

## The K-W MASTER VIBRATOR.

Why?

Because the Master Vibrator does a great deal more than simply replace the four separate vibrators on a coil.

It is NOT A VIBRATOR in the ordinary sense, but a scientifically constructed MAGNETIC CIRCUIT BREAKER which times the spark more accurately than the ordinary High Tension Magneto.

It is so designed as to utilize the alternating current of the Ford Magneto and make the coil produce a MUCH HOTTER SPARK than it could produce with any other vibrator.

No matter what coil you now have, whether it has four vibrators or one, THE K-W MASTER VIBRATOR will give you:

A HOTTER SPARK, preventing sooty LARGER CONTACT POINTS and plugs and carbonizing. handsome switch.

EASY STARTING, due to the hotter INCREASED SATISFACTION with your car.

MORE POWER. It makes the hills "Fade Away." EASILY PUT ON IN HALF AN HOUR, no changes in car necessary.

OUR GUARANTEE.—If you ever feel that you can get along without it, return it within 30 days. Money back and no questions asked.

PRICE, \$15.00. Express prepaid if cash accompanies the order.

BE SURE  
TO GET



AND HAVE  
THAT

SATISFIED FEELING

There is only one genuine time-tested and guaranteed Master Vibrator. The scientifically constructed Magnetic Circuit Breaker on the K-W Master Vibrator, when used with the Ford Magneto, will give as good results as an ordinary High Tension Magneto.

We make a complete line of Ignition apparatus.

Don't simply ask for Catalogue—Tell us your troubles and we will help you.

THE K-W IGNITION CO.  
2835 Chester Ave. CLEVELAND, OHIO, U.S.A.

WE PAY THE EXPRESS East of the Mississippi River or to the Mississippi on points beyond on any of our goods, when cash accompanies the order.



# Warner

## AUTO-METER



For sale by leading dealers all over the world and at our branches listed below. The prices are never changed—never cut. They never vary. You pay the same price in one state as you would in another. Priced from \$50 to \$145, according to size and style.

The Warner instrument is *made like a fine watch*. It is a thoroughly jeweled instrument. The jewels used are *select first quality Sapphires*, accurate to 1-2000th of an inch and polished like a diamond. These sapphires insure absolute precision—for life.

*Handsome Catalog on Request*

**Stewart-Warner Speedometer Corporation**

**Factories: Chicago and Beloit**

**General Offices: 1931 Diversey Blvd., Chicago**

New York Los Angeles Chicago Minneapolis Kansas City San Francisco  
Detroit Philadelphia Indianapolis Cleveland Boston St. Louis Atlanta Buffalo  
Cincinnati Denver Pittsburgh Portland Seattle Toronto London Paris

### SPECIAL

We have arranged to place the splendid facilities of our Beloit factory at the disposal of automobile engineers for the purpose of designing new models of speedometers, with special installations and driving equipment adapted to meet the individual requirements of each special make of motor car.

### The WARNER AUTO-METER

(Magnetic Type)

Is the "**Dominant Speedometer**" with both the makers and the owners of high priced American motor cars. Nearly all of the makers of high priced automobiles are now installing the Warner as "regular equipment" on their cars. In their catalogs and in their newspaper, periodical and magazine advertising you will find the name "Warner" displayed prominently in bold type. They want that name to catch the eye of the prospective car buyer. Makers of the highest priced cars specify the Warner in their advertising and install it on their product because they know that the class which purchases their cars—keen, well-posted, fastidious buyers—insist on the highest quality of equipment and will have none other than the Warner Auto-Meter. Owners of high priced cars are proud of the Warner Auto-Meter equipment because it has a reputation for highest excellence and in keeping with their standard of exacting requirement.

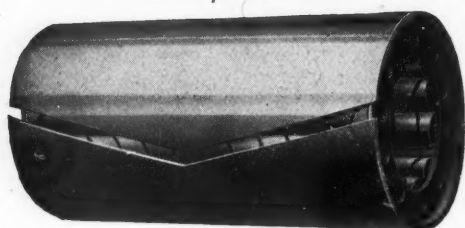


**Model K2**  
**Price \$75**





## Hyatt Quiet Bearings



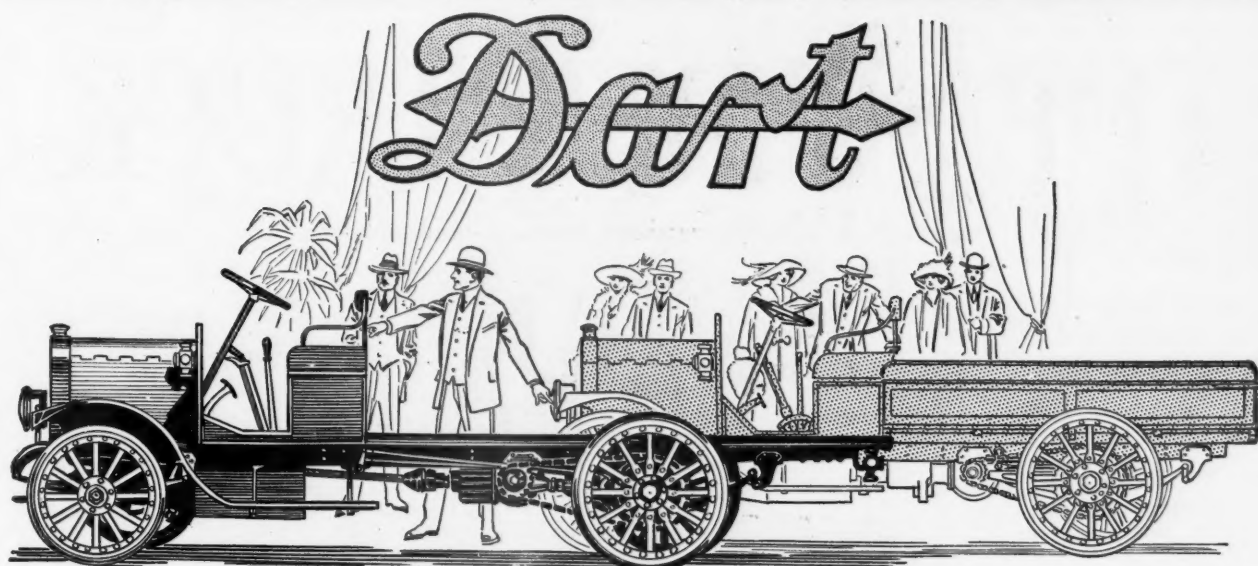
The Standard Type of the Hyatt Roller Bearing is designed with generous bearing length. This permits the rollers to operate directly on a steel shaft, thereby simplifying the construction.

The flexibility of the Hyatt Roller affords full line contact, hence an equal distribution of the load along the entire length of the bearing. Overloading at any particular point, causing excessive wear, is thus avoided.

The rollers of the standard type are now made of Chrome Nickel Steel, resulting in a greatly increased carrying capacity. Lubrication is positive—the rollers forming oil reservoirs. The right and left spirals distribute oil to every part of the bearing. Grit and dirt work through into the centre of the hollow rollers, thus preventing grinding which would result in wear.

These are exclusive features of the Hyatt Roller Bearing.

**HYATT ROLLER BEARING CO.**  
**DETROIT, MICHIGAN**



# See These Dart Trucks At The Shows

**T**HERE'S a revelation in auto trucks awaiting you at the New York and Chicago Shows. The new 1913 Model Dart Trucks—triumphs of engineering skill and made to sell at exceedingly moderate prices—will be on exhibit for the inspection of truck users and dealers.

The money-making opportunities which these trucks offer to dealers and users are so tremendous as to be positively remarkable. If you intend to visit either of the shows let your attention center on the Dart exhibits and let us explain to you our 1913 proposition.

## Prices That Shatter Traditions

We've shattered to atoms the tradition that a substantial, well-built truck with liberal specifications **had to** sell for \$3,000 to \$5,000. The new 1913 Dart Trucks at \$1,100 and \$1,800 include more *actual, tangible* value than can be found in any other truck of the same capacity in the entire world. They set a *new standard of value*. They embody all the meritorious points

gleaned from twenty years of experience. The liberal specifications will amaze you.

## A Remarkable Test

The wonderful performances of Dart Trucks are significant of their exceptional construction. In a recent hill climbing test a Dart truck carried a full load up Giant's Despair Mountain at Wilkes-Barre, Pa.—a grade of 37½%. This performance indicates the efficiency of the Dart—its wonderful durability and power.

## Three Models for 1913

The 1913 line of Dart trucks comprises these three chasses—each a remarkable value:

Model ED	1000 lbs. capacity (2 cyl.)	- \$ 750
Model B	1000 to 2000 lbs. capacity (4 cyl.)	1100
Model C	2000 to 3000 lbs. capacity (4 cyl.)	1775

Steel wheels, with Goodyear hard rubber base tires furnished on Models B and C for \$100 per car extra.

Complete specifications and detailed information about our 1913 proposition can be obtained at our exhibits or by writing us at the factory.

## Dart Trucks will be Exhibited at the Following Shows:

### NEW YORK

Grand Central Palace—Section 42A

### CHICAGO

Coliseum Annex—Space Q1

*Come and See These Remarkable Trucks or Write Us.*

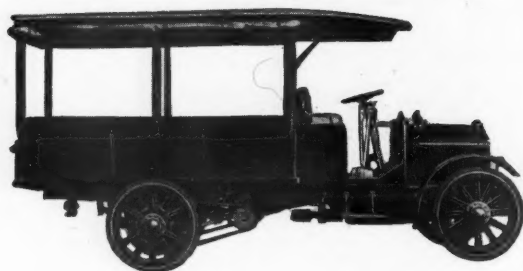
**DART MOTOR MANUFACTURING CO., Waterloo, Iowa**

(10)



# THE SELDEN TRUCK

## \$2000



### The Selden One-Ton Truck Is the Highest Type of Commercial Car

It is strong—with a large factor of safety.  
It is durable and dependable.  
It is economical to run.  
It is easy to care for—every part is accessible.  
It is built for hard service and long life.

### IT IS EASY TO BUY AND EASY TO PAY FOR

The Selden Truck which represents the highest cash value of any truck in its class is sold on the Time Payment Plan in order that it may be available to those who don't find it convenient to pay spot cash.

### A Selden Truck Once Put Into Service Earns Its Own Payments

We have some good territory open for live, responsible dealers who want the best selling proposition ever offered.

Write for catalogue and particulars of our sales plan.

## SELDEN TRUCK SALES COMPANY

159 East Ave.

Rochester, N. Y.



## IT'S KNOWN BY ITS 4 BIG FEATURES

Our magnificent new 1913 instrument is an example of highest development in the construction of a

### Magnetic Speedometer

The magnetic principle is the only scientific principle of speedometer construction. It is—by far—the most costly construction. The magnetic principle—alone—permits the use of a frictionless indicating means and of low speed, non-vibrating drive.

THE NEW 1913

# Stewart Speedometer

Has Four Splendid Features

The New 1913 Stewart Speedometer has the new "reversed" revolving Speed Dial with Zero Stop mounted on full jeweled bearings and operated by Tungsten steel magnet, Stewart "closed ring" type. Steady and accurate at all speeds. Read at a glance

### We Threw It Away!

#### Our Old Centrifugal Type Speedometer

The first speedometer we made was of the centrifugal type—but long ago we cast it upon the scrap heap of the obsolete—

—because the governor of a centrifugal instrument must revolve at a high speed of over *two thousand five hundred revolutions* to the mile, causing vibration and bearing friction that no instrument can stand.

—because the centrifugal type *will not indicate* any speed under 7 miles an hour!

—because continued accuracy with a centrifugal type of speedometer is utterly impossible. It is necessary to multiply the movement of the indicating means *sixteen times* in order to get a movement of the pointer hand sufficient to permit the use of a scale large enough to be readable. *Therefore, any error in accuracy is multiplied sixteen times!*

—because our new and perfected type of **MAGNETIC** speedometer has rendered all types of centrifugal speedometers crude and obsolete!

It has a big, sturdy 100,000-mile Season Register, operated by "direct drive" gears and controlled by "Geneva Stop" mechanism.

It has a 100-mile Trip Register that can be rapidly reset to any tenth of a mile and without disturbing the record of the Season Register. This is an excellent feature for motorists when following instructions of route book while touring.

It has the Grade Indicator with revolving dial mounted on polished bearings and operated by gravity. Shows the various percentages of grades from zero up to 30 degrees.

IF YOU DESIRE PERMANENT SATISFACTION SEE THAT THE MAGNIFICENT NEW 1913 STEWART SPEEDOMETER IS INSTALLED ON THE CAR YOU BUY

### Stewart-Warner Speedometer Corporation

Factories at Chicago and Beloit

General Offices: 1931 Diversey Blvd., Chicago

New York	Los Angeles	Chicago	Minneapolis	Kansas City	San Francisco	Detroit
Philadelphia	Indianapolis	Cleveland	Boston	St. Louis	Buffalo	Cincinnati
Denver	Pittsburgh	Portland	Seattle	Toronto	London	Paris



# The Gas Tank Patent Has Expired

The U. S. Circuit Court of Appeals, for the 7th Circuit, has just decided that the patent of the Commercial Acetylene Company has expired.

This leaves anyone free to manufacture and sell gas tanks of their own make.

But it does not give anyone permission to refill Our Tanks. We have easily stopped this in many parts of the country, by order of the U. S.

Courts. We shall now proceed to stop this practice everywhere.

Other companies are now free to get all the business they can legitimately on tanks of their own make, and free to re-fill their own tanks.

As to the future, it is evident that the whole gas tank industry settles down to the plain proposition of service.

You already know what Prest-O-Lite Service is.

# Watch! — Wait! — Listen!

**The Prest-O-Lite Company**  
**Indianapolis, Indiana**

**Canadian Factory and Branch Office: Merriton, Ont.**

SERVICE STATIONS IN THESE CITIES: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn., Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Providence, St. Louis, St. Paul, Minn., San Antonio, San Francisco, Seattle, Syracuse. SERVICE STATIONS IN CANADA: Merriton, Ontario; Toronto, Ontario; Winnipeg, Manitoba.

***Exchange Agencies Everywhere***



"THE STEADY HAND"

# HOFFECKER SPEEDOMETER



The quality car requires high class equipment and the speedometer is never overlooked by the manufacturer of such a car.

This is why

## HOFFECKER

speedometers are found on the dashboards of America's high class cars. Wherever speedometer accuracy is desired, there you will find the HOFFECKER.

See our exhibit at the  
Automobile Shows.



### THE HOFFECKER CO.

Main Offices:

MOTOR MART BOSTON, MASS.  
Branches: New York, Cleveland, Pittsburgh,  
Chicago, Philadelphia

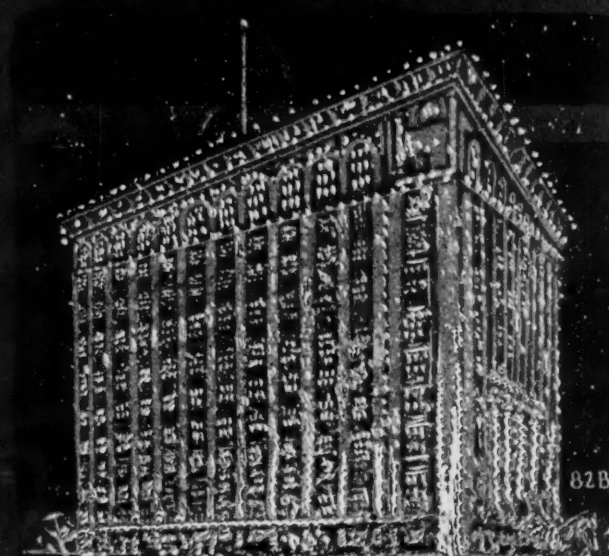
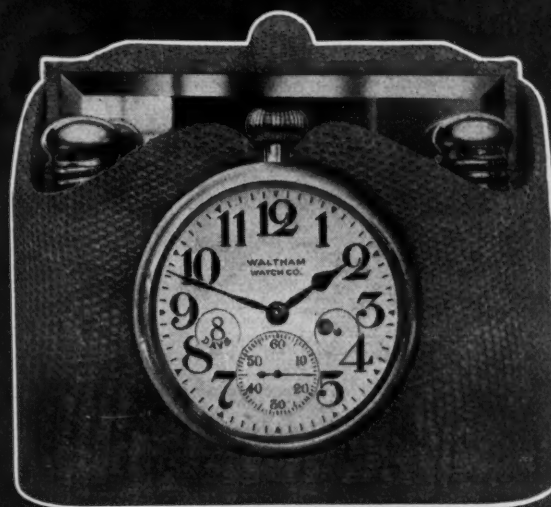
The Waltham is the only timepiece made for automobiles having fifteen jewels and adjusted to temperature.

This unerring instrument will run ten days on one winding. Its warning indicator gives notice of the necessity of rewinding three days before the timepiece runs down.

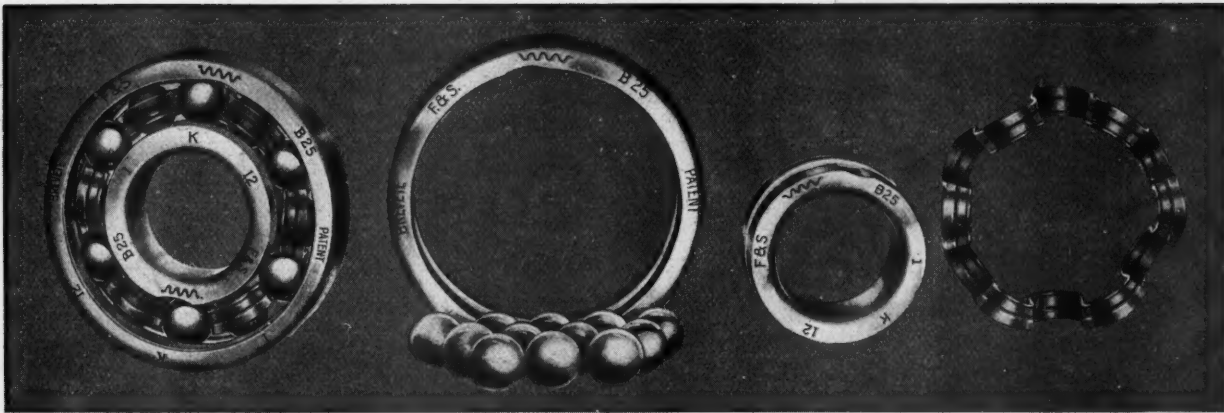
Accurate, reliable and fully warranted, it is a real Waltham, and you need it on your car.

THE WALTHAM WATCH CO.  
WALTHAM MASS.

"THE JEWELLED"  
**WALTHAM**  
❖ TIMEPIECE ❖







“ALL THAT WILL BE MENTIONED, therefore, are the requirements which a good ball-bearing cage must meet:

(a) As small a space as possible between the balls, so that the maximum number may be put in; (b) To guide them well and safely;

(c) To eliminate parts which may get loose, i. e., to make the cage if possible of one piece; (d) To use material which is not too soft, so that the cage will not wear out quickly;

(e) To avoid excess weight; (f) Solid elastic material to sustain shocks without breaking;

(g) Construction such that no parts can get between or under the balls and wedge them, in case the cage breaks; (h) Or, should the cage break, the work of the bearing will not be disturbed;

(i) Quickly putting into or taking cage out of bearing; (j) Ready access for the lubricant to the balls and raceways;

(k) To eliminate pockets in which foreign substances can become lodged and act as a brake on the balls; (l) To expose the balls so that the bearing can be cleaned and examined without taking it apart.”—FRANZ J. JAROSCH, M.E., MEMBER OF S.A.E.

**BRETZ COMPANY**

SOLE IMPORTERS

250 West Fifty-fourth  
New York City

1913  
F & S Blue Ribbon Retainer  
is  
"Sui Generis"  
Meaning "the only one of its kind"

"IF ALL THE DIFFERENT KINDS of ball-bearing cages used are examined with reference to the qualities mentioned, the conclusion is reached that these qualities are best combined in a construction as shown."

"If the frictional relations and the distribution of the load are observed, the sum of the main factors of the permissible load—the number of balls times the size of the balls—is compared in the various ball bearings on the market, the qualities of the ball cage necessary are looked into, and if finally these ball bearings are examined with reference to material, precision in their manufacture and durability, it will soon be discovered that the ball bearing shown, made by FICHTEL & SACHS, Germany, possesses the best qualities in every respect and must be put at the head of all other radial ball bearings."—ADDENDA BY FRANZ J. JAROSCH, M.E.

F & S  
Ball Bearings





I THOUGHT  
THE JAPS  
WERE BUM  
SOLDIERS AND  
THE TURKS COULDN'T  
BE WHIPPED. I  
THOUGHT THAT  
A DEMOCRAT  
COULDN'T BE  
ELECTED AND  
I'M NOT QUITE  
SURE THAT  
AIREASE  
IS ANY GOOD

POOR  
DOUBTING  
THOMAS

# Airease

## Every Generation Has Its "Doubters"

They laugh at improvement and think that the height of development is represented in their own age. Such men think that we will never be able to fly. They thought that steam would never supplant sails, and if they happen to be motorists they are foolish enough to believe that the modern pneumatic tire is the best the rubber industry can offer.

They accept tire troubles—punctures, blow-outs and rim-cuts—as the necessary evils that must accompany motoring. They reject tire fillers, because some one had an unpleasant experience with some pretending tire filler, and they doubt the efficacy of AIREASE regardless of the fact that expert chemists and scientific societies pronounce it a positively perfect substitute for compressed air.

The AIREASERS escape  
a legal puncture



The fact that inner tubes filled with AIREASE can be transferred from one shoe to another; that AIREASE tubes will outlast any automobile; that they ride as easily and as resiliently as air; that AIREASE has no glue or moisture, or gelatine or glycerine to harden or compress; all these facts backed up by a million-dollar corporation and a positive guarantee that not only money, but new tubes will be returned if desired, makes AIREASE the long-sought substitute for air.

WHY YOU SHOULD BE

**When stepping into your car for a spin the absolute assurance that the tires can't go wrong is an inexpressible delight.**

## **It's Hard to Sell Gold Dollars for Fifteen Cents!**

We encountered just this kind of opposition. We found motorists and dealers who were disgusted with the so-called tire fillers because they had met the kind whose resiliency either evaporated, hardened or leaked out through the tube. At first they were hard to convince that AIREASE was different—a better substitute for pneumatic tires than had ever before been produced. But today dealers that we had to coax are flocking around for the AIREASE agency in their section.

There is only one explanation for this fact: AIREASE HAS POSITIVELY AND UNQUALIFIEDLY DEMONSTRATED ITS WORTH AS THE REAL AND ONLY TIRE FILLER. THE SOLUTION OF THE ALL-PERPLEXING PROBLEM OF TIRE TROUBLE AND EXPENSE.

Now when men who make their living selling automobile accessories come to their oats and admit the merit of a new product, it is pretty good horse sense to suppose that that product has real merit. AIREASE is such a product. It was invented by a famous chemist. And it is flawless in composition. It positively will not dry out or lose its resiliency. It is the final, the only answer to the question—HOW CAN WE GET ALONG WITHOUT PUNCTURES AND BLOW-OUTS?

**Airease Tire Filler Co.,**  
**Corner 14th and Pennsylvania Avenue**  
**Washington, D. C.**

**AN AIREASER IN THE NEXT ISSUE**



**A FEW WEEKS AGO  
WE WERE COAXING  
DEALERS**



**NOW THEY  
FIGHT FOR  
TERRITORY**

MARK WITH X PROPOSITION YOU ARE INTERESTED IN  
**AIREASE TIRE FILLER COMPANY, Washington, D. C.**  
Gentlemen:  
☐ I am interested in tire filling and desire to know the cost of filling my tires. Front size, ..... rear size, .....  
☐ I am interested in Airease. Please furnish me cost of filling plant for this territory.  
Name.....  
Street.....  
City.....

M. A.  
1-10-18



# The Right Light For Your New Car

Why does gas lighting with an automatic lighter give you just as much convenience and more efficiency, reliability, and economy than any other lighting system? Here are the facts. Keep them in mind in deciding upon any system of automobile lighting.

## Convenience

First of all, you say you want convenience in your lighting system.

Prest-O-Lite, when used in connection with an automatic gas lighter, offers you perfect convenience.

You can use gas in all your lamps, and you can light or extinguish all or any of the lights from the driver's seat, whether your car be moving or standing still. The flow of gas is automatically regulated to produce exactly the proper height of flame at all times. There are several good automatic gas lighters on the market. We make one—the Prest-O-Lite. It is about as simple as an electric doorbell. Any of our Service Stations will gladly demonstrate it to you. See it and judge for yourself whether any other system is any more convenient.

Then remember this **distinct advantage**, that should it ever be temporarily disabled, you are not left in the dark. You can light your gas lamps with matches, and **YOU STILL HAVE LIGHT.**

## Reliability

Any lighting system on a motor car is subject to the heaviest jolts and shocks. Because of this, and because one must either carry or make his own light, automobile and house lighting are entirely different propositions.

Prest-O-Lite's absolute reliability is unquestioned. There are no delicate adjustments, connections, or complicated attachments to get out of order. Prest-O-Lite is so absolutely simple, it is trouble-proof. If, through carelessness, you allow your Prest-O-Lite to run dry, a Prest-O-Lite agency is close by, wherever you may be. Every city and town, and nearly every cross-road village, has its Prest-O-Lite exchange agency.

Here, then, is a system that every dealer understands; that never need leave you stranded on a country road; that never keeps you waiting for a factory expert to come and restore its usefulness; that is not affected by the heaviest downpour of rain.

In short, you have in Prest-O-Lite a system you can absolutely depend upon all of the time.

No matter what self-starter is on your car, your lights should be gas lights. A self-starter is, after all, a highly desirable convenience, but not an actual necessity. Reliable lighting on your car is almost as essential as fuel. The disabling of a self-starter might mean, at the worst, your having to use the starting crank, but an accident to your lighting system may leave you helpless in the dark. But so long as you have Prest-O-Lite and matches, you have light. Almost any manufacturer will equip your new car with Prest-O-Lite and an automatic gas lighter, if you insist. If your car is now equipped with Prest-O-Lite, any of our Service Stations or any dealer can install an automatic lighter at small expense.

Before you decide on any lighting system, post yourself thoroughly by sending for a free booklet, "Light on the Lighting Problem," reprinted by permission, which gives all the facts on lighting prepared by one of the foremost authorities. By sending coupon below, it will reach you without charge by return mail.

## Efficiency

Exhaustive experiments have proven that the naked light of a  $\frac{3}{4}$ -foot acetylene burner gives 30 candle power without a reflector. The average naked light in other systems is 20 candle power or less. Weaker lights than Prest-O-Lite can give a blinding effect by the use of parabolic reflectors.

This principle was first employed in gas lamps, but was discarded as unsatisfactory, because, while this type of reflector threw brilliant, concentrated rays far ahead it did not give the light **down on the ground** 10 to 50 feet ahead of the car, where you need it most, to give a perfect view of the road itself. Every experienced driver will tell you that Prest-O-Lite, with the reflectors now used in the gas lamps, gives all the light needed far ahead, and **in addition** gives a light immediately in front of the car which affords the driver a better idea of the ruts and bumps than he can get **even in broad sunlight.** This effect cannot be had from any lamps using parabolic reflectors.

Prest-O-Lite, as a practical road light for the driver, has no equal.

## Economy

There is no other efficient lighting system that costs less to operate and maintain than Prest-O-Lite. The average cost of Prest-O-Lite operation, among over five hundred thousand actual users, is less than \$10 per year. The user has no expense for repairs, for renewal of worn-out parts, or for adjustments, and its operation consumes no power and in no way interferes with the full efficiency of your engine.

Just one repair bill on any complicated, delicate lighting system might easily cost more than years of Prest-O-Lite service.

But even if Prest-O-Lite operation costs more than other lighting systems—instead of less—its reliability, its efficiency, its freedom from annoying troubles, should make it twice as valuable to any experienced driver.

**THE PREST-O-LITE COMPANY**  
233 E. South Street, Indianapolis, Ind.

Please send free booklet, "Light on the Lighting Problem," to

Name .....

Address .....

**The Prest-O-Lite Company,** 233 East South Street, INDIANAPOLIS, IND.  
CANADIAN FACTORY AND GENERAL OFFICE, MERRITTON, ONT.  
SERVICE STATIONS IN THESE CITIES: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn., Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Providence, St. Louis, St. Paul, Minn., San Antonio, San Francisco, Seattle, Syracuse.  
SERVICE STATIONS IN CANADA: Merritton, Ontario; Toronto, Ontario; Winnipeg, Manitoba.

## Insist on Gas Lighting

When Writing to Advertisers, Please Mention Motor Age.

# The Right Light For The Dealer

## You Can "Cash In" On This Campaign

More than 10,000,000 readers will see Prest-O-Lite advertisements along the lines of the one on the opposite page. Among these readers are **your patrons and prospects.**

You'll want to read these advertisements carefully. Be prepared to reap what we are sowing.

### How To Do It

You are familiar with the Prest-O-Lite Gas Tank Proposition—what it means to you as a dealer, and what it means to the hundreds of thousands users of Prest-O-Lite.

You should be equally familiar with the Prest-O-Liter. It is the final touch that adds unexcelled convenience to an efficiency and reliability that has never been questioned.

Consider the field open to you, the number of cars equipped with gas, to say nothing of the new cars every day. All these are your prospects.

#### The Prest-O-Liter

is a simple, efficient, automatic lighter for gas lamps that you ought to know about. It consists of the car's ignition battery or a few dry cells, a coil, wires to the lamps, an automatic reducing valve and a control valve and a push button on the dash. Turn the valve, push the button and the lamps are lit.

The Prest-O-Liter is easily and quickly installed and gives the user every convenience of the most complicated and expensive system, with greater reliability and economy in upkeep.

#### Send for Details

Every dealer should know about the Prest-O-Lite Campaign for **reliable automatic lighting.**

You'll want to be able to demonstrate and install the Prest-O-Liter, when the calls come.

We're ready to help you in every way and furnish literature for you to distribute. Use the coupon below, get in touch with the movement and be prepared to get your share when this business comes your way.

#### The Prest-O-Lite Company, 233 East South Street, INDIANAPOLIS, IND.

CANADIAN FACTORY AND GENERAL OFFICE, MERRITTON, ONT.  
SERVICE STATIONS IN THESE CITIES: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn., Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Ore., Providence, St. Louis, St. Paul, Minn., San Antonio, San Francisco, Seattle, Syracuse.  
SERVICE STATIONS IN CANADA: Merritton, Ontario; Toronto, Ontario; Winnipeg, Manitoba.

#### PREST-O-LITE COMPANY

233 East South Street, Indianapolis, Ind.

Kindly send full particulars on Prest-O-Liter and keep me in touch with your "Insist on Gas Lighting" Campaign.

Name .....

Address .....

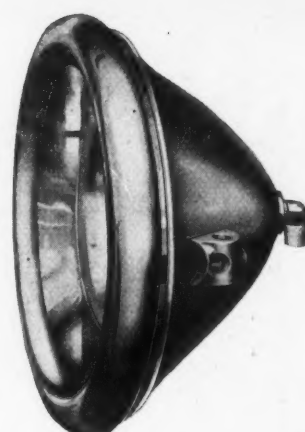
## Insist on Gas Lighting

*When Writing to Advertisers, Please Mention Motor Age.*





**Here's a Pair of Lamps**  
You Will Be Proud To Have On Your Car



## APLCO Golden Glow Electric Headlights

contain more up-to-date features than any other automobile lamp made

1. They project light through fog and dust.
2. Locked against bulb thieves.
3. Focused without opening.
4. Absolutely water and dust-proof.
5. Glass reflector can be polished with a cloth without injury.
9. Has neither hinge or outside fastening.
7. Exclusive design adds distinction to your car.
8. Beautiful finish.
9. Has neither hinge nor outside fastening.
10. Guaranteed to project a better light for a farther distance than any other lamp made.

*Send for Booklet "A Drive Behind Bill's Lamps" Today*

### TO DEALERS

Here are just the lamps you need for your trade to replace the inferior lamps now furnished as regular equipment on new cars. Write for special proposition.

=====OooOooO=====

### Don't Miss Our Exhibits

During the Automobile Shows in Chicago and New York. We will show the Aplco Electric Engine Starters and Electric Lighting Systems at our stores, 20 Vesey St., New York; 1508 Michigan Avenue, Chicago.



## THE APPLE ELECTRIC COMPANY

An Ohio Corporation. Capital \$300,000 fully paid

**20 Vesey Street, New York**  
**1508 Michigan Avenue, Chicago**

**Factory, 15 N. Canal Street**  
**Dayton, Ohio, U. S. A.**



*When Writing to Advertisers, Please Mention Motor Age.*

# J-D Visible Spark Plug Cured This Man

## Before



## After



*R*

**Diagnosis** - - - - - **Ignition Trouble**

**Prescription** - **One Set J-D Visible Spark Plugs**

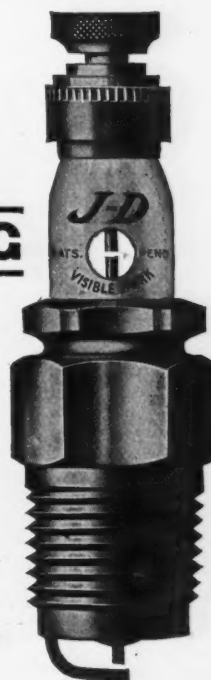
**Fee** - - - - - **\$1 per Plug**

*Money back if not absolutely satisfied*

## We Can Cure YOUR Ignition Troubles, Too

The new principle embodied in the J-D Visible Gap Spark Plug enables you to locate and cure ignition trouble at a single glance. Through the port in the porcelain—**outside** the motor—you see if the spark is jumping the gap in the central electrode. No more need to hunt and test and fuss. If the spark jumps, but proper ignition fails to follow, then the plug must be foul or the carburetion faulty. If the spark does not jump, then trouble lies behind in magneto or wiring or coil or batteries. Knurled adjusting nut allows you to widen or close gap. Opened, it intensifies spark and cleans point automatically. Uses minimum current, makes timing of engine easy, and permits regulating of spark in any cylinder.

**\$1.00**



## ONE LOOK TELLS EVERYTHING

This is THE plug. It marks the biggest advance ever made in spark plug manufacture. We want to prove it to you. If your dealer has not yet put the J-D Visible plug in stock, we will mail you prepaid on receipt of price—just \$1 per plug, the price of any good plug. **Write and tell us the size wanted and make of car.** And back of every plug you order we put our ironclad guarantee, "absolute satisfaction or your money back." Your word goes. We make millions of plugs every year—nothing else—of finest materials, even importing our clays and other ingredients for our porcelain that defies heat.

*When you write, ask us for our free book on Ignition—a classic with motorists. It will make you master of your ignition system*

### JEFFERY-DEWITT COMPANY

551 Butler Avenue

Detroit, Michigan

*Largest Manufacturers of Spark Plugs in the World*

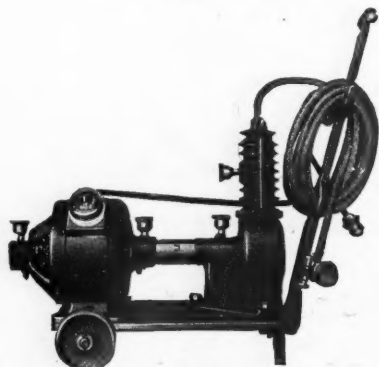
*When Writing to Advertisers, Please Mention Motor Age.*





**"IMPERIAL TWELVE"**

Belted and Water Cooled  
Made in Three Sizes



**"IMPERIAL TWELVE"**

Tire Pump—Air Cooled and Motor Driven



**"IMPERIAL TWELVE"**

Short Belt Motor Driven and Reservoir Cooled



**"IMPERIAL TWELVE"**

Portable—Short Belt Motor Driven, Air Cooled  
Receiver on Truck

# Garage Compressors

## "Imperial Twelve"

Here is a new line of garage compressors which has established a new standard in the trade.

The explanation lies in the fact that **they are real air compressors**—not air pumps—built by the oldest and largest builders of air compressors in the world whose total compressor output aggregates more than 15,000,000 H. P.

The "Imperial Twelve" is a vertical, single-cylinder compressor, made in a variety of types and sizes (some of which are here illustrated) in capacities of 6 to 23 cubic feet of free air per minute, for pressures of 60 to 100 lbs.

There are air cooled, water cooled, or reservoir types—belted or motor driven—stationary or portable units—every one built as well as such machines can be made, by the company who has built most of the air compressors in use today, the world over.

If it is **service** you are looking for—real **value**—thorough **dependability** and good **economy** — the "Imperial Twelve" is the compressor you want, in the type you need.

See It At All the Automobile Shows

Bulletin 3022

# Ingersoll-Rand Co.

NEW YORK

LONDON

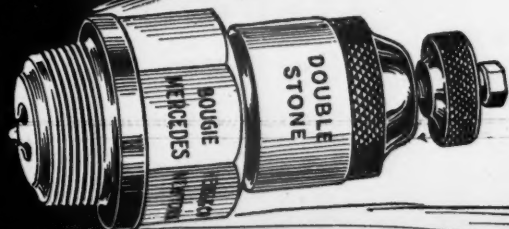
Offices in all Principal Cities of the World

**Compressors**

**Air Tools**

**Air Hoists**

# Never a Miss!



## HERZ PLUG

*"Bougie Mercedes"*

### IS THE PLUG FOR A FAT, HOT SPARK

It has four sparking points to provide for any Magneto tension, high or low.

The electrode is Platinum-alloy. It will not burn away.

HERZ PLUG is self-cleaning—  
not affected by oil, soot, dust  
or water.

The insulation is double-stone,  
no cheap porcelain to crack.

HERZ PLUG stands up. At  
\$1.50 it is the most economic-  
al Plug on the market, be-  
cause it will outlive ten of  
the ordinary kind.

**GUARANTEED A FULL YEAR**  
and its average service is several times that long

From any  
dealer, or

**HERZ & CO.**

295 Lafayette St.,  
New York

Ask for Blue Enameled Stone.



# Protect Your Trucks

*from the*

## Cobble Stones and Granite



It's in the spokes

The eternal hammering of the heavily laden truck over the hard, unyielding pavements of the city streets and the ruts and hummocks of the country roads subjects the motor and the entire chassis to destructive violence far greater than that encountered by the more resiliently assembled pleasure car. It is this perpetual jarring that makes the depreciation of motor trucks so rapid and the repair bills so great. The

## IDEAL RESILIENT STEEL WHEEL

absorbs the shocks of roadway within itself **before they reach the axle** and thereby cushions the entire car from the violence of jarring over the pavements and makes the motor truck run as smoothly as the touring car.

Ideal Resilient Steel Wheels increase the life of tires, reduce the strain on motor, differential, clutch and brakes, prevent misadjustments of the delicate parts of the mechanism and insure longer life, more service and lower cost of operation and maintenance.

These wheels are made for every type of motor-driven vehicle. They are instantly demountable and can be slipped on over the spindles of the axles by the removal of the dust cap. The spokes, of chrome vanadium steel, can be inserted or withdrawn without jacking up the car.

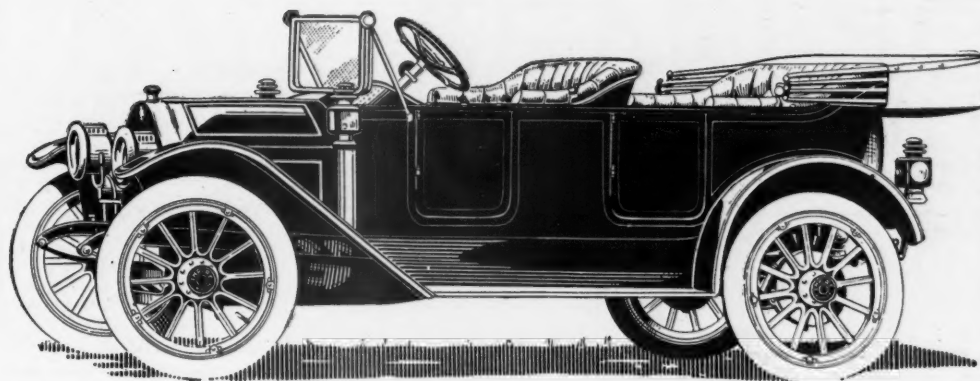
Ideal Resilient Steel Wheels are guaranteed to be stronger under dead load, lateral strain, side swipe and torsion than any wooden wheels now commercially produced.

*Write for literature today*

### Ideal Steel Wheel Company

1069 First National Bank Building

Cincinnati, Ohio



# EMPIRE

*"The Little Aristocrat"*

Model 31

*Style, Distinction and Character in every line.  
Power, Speed and Strength to match the Design.*

**Completely Equipped, \$950**

108 in. Wheel Base	Demountable Rims	Double Tire Irons	Speedometer
Mohair Top	Windshield	Prest-O-Lite Tank	Jack & Tool Kit
Top Envelope	Roof & Foot Rail	Head, Side and	Extra Rim
Storm Curtains	Over Size Tires	Tail Lamps	Eisemann Magneto

**T**HE \$950.00 completely equipped EMPIRE Five Passenger Touring Car meets the demand of those who know car values. Everywhere it is winning its way with expert motorists who demand a car of moderate size and price, and insist on having a real car, built of quality materials and honestly constructed.

We knew that in time "The Little Aristocrat" would come into its own kingdom. We foresaw increased demand. But it was gratifying to have been compelled to establish a second factory.

We want you to know the EMPIRE. Examine "The Little Aristocrat." Learn why it has won, why it satisfies.

*See the Empire, Special Chicago Show, February 1st to 8th*

## RALPH TEMPLE AUTO COMPANY

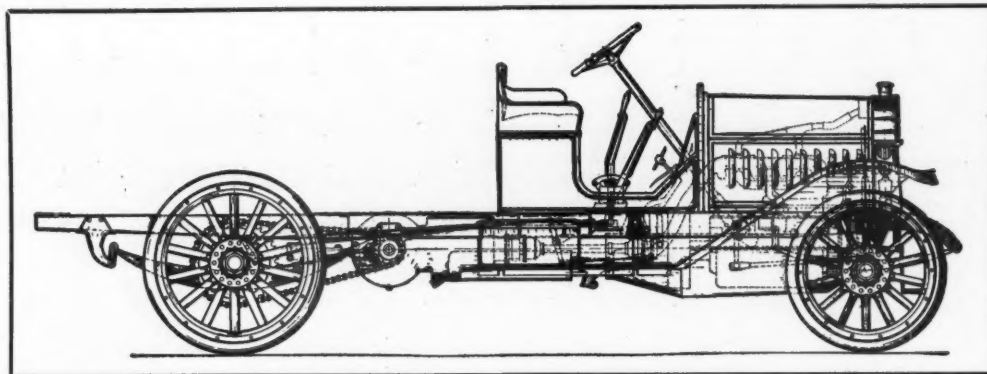
1221 Michigan Avenue

Chicago, Illinois

Write for New Descriptive Catalog

**Empire Automobile Company, Indianapolis, U. S. A.**





## A new record breaking 2500 lb. Kissel truck

**T**HIS new 2500 lb. KisselKar Truck is a distinctive innovation in commercial vehicles of this capacity. It is a genuine truck of solid and substantial construction from the ground up—heavy, high grade construction, such as has never before been put into a commercial truck of this capacity. It is the result of truck building experience and a careful correction of every known truck trouble. From the standpoints of design, construction, ability and price, it has absolutely no competition.

Motor—36 H. P. 4 cylinders cast in pairs  $4\frac{1}{4} \times 5\frac{1}{4}$ .

Unit construction, large heavy Chrome Vanadium gears and shaft.

Frame of extra heavy pressed steel, the size usually found in 2 ton trucks.

Has foreign design spiral radiator which gives 50% greater radiation than ordinary types.

Radiator is protected by heavy aluminum casing and suspended on springs, greatly minimizing vibration.

Power plant supported at three points by spring suspension to give flexibility and further reduce vibration, and keep working parts in alignment.

Final chain drive and differential lock by which both drive wheels may be locked together on solid axle preventing one wheel from absorbing power when spinning on ice, in mud or snow.

Speed controller which regulates the speed of the truck and not the motor.

Lefthand drive and center control.

Big wheels, 38x5 tires, such as are usually used on trucks of double this capacity. This means economy and tire manufacturer's guarantee.

Demountable rims.  
Extra large axles.

All levers, rods, and joints of extra size.

Metal running footboard.

Two lengths of frames and wheelbase—8x5½ body and 10x5½ body.

**Don't Fail to See This  
Truck.**

In every point of design and construction this truck is superior to anything of like capacity ever built. It is the new, big feature of the truck field.

See it at the shows.

New York—Space 113-A Madison Square Garden.

Chicago—Section C Coliseum.

## KISSELKAR TRUCKS

1500 lb., 1 ton, 2500 lb., 2, 3, 4, 5 ton trucks,  
Delivery Cars, Fire Department Apparatus,  
Ambulances, Etc. Write for truck catalog.

**Kissel Motor Car Company, 121 Kissel Ave., Hartford, Wis.**

BOSTON NEW YORK CHICAGO MILWAUKEE KANSAS CITY  
LOS ANGELES MINNEAPOLIS ST. PAUL DALLAS  
Philadelphia, Cleveland, Detroit, El Paso, San Antonio, New Orleans, Baltimore, Omaha, Butte, Denver, San Francisco, Seattle, Portland, Duluth, Buffalo, Pittsburg, Hartford, Conn., New Haven, Albany, Troy, Montreal, Quebec, Toronto, Winnipeg, and 200 other principal points throughout America.

# NEW DEPARTURE BALL BEARINGS

American Made *for* American Trade

*Madison Square Garden, Space No. 204 Balcony*

## GASOLINE IS GOING UP

and you, Mr. Motorist, are paying the bills. Abroad, where gasoline costs half-a-dollar a gallon, builders of automobiles use only ball bearings.

Why?

Because ball bearings are more thoroughly anti-friction than any other type. Friction scarcely exists at all in ball bearings,—hence less power and less fuel are required to drive mechanism mounted on such bearings.

Other advantages are:

Minimum wear;

Maximum efficiency, endurance and dependability;

Ease of replacement;

Freedom from necessity of frequent adjustment;—ball bearings are fool-proof.

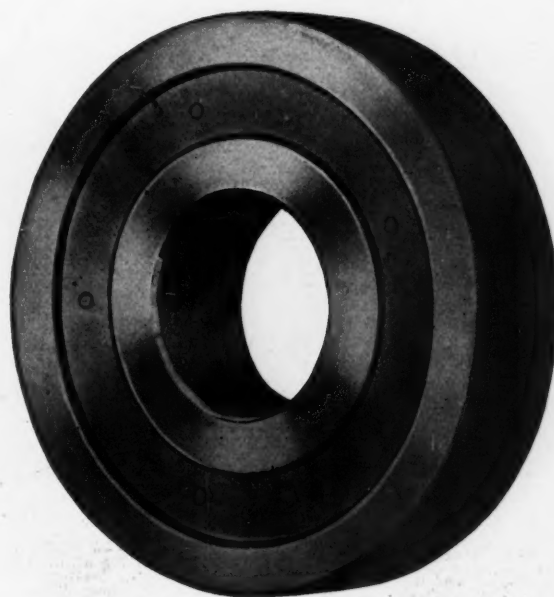
The American made New Departure Ball Bearings have no superior—are strongly guaranteed and preferred by the majority of American automobile manufacturers.

One such manufacturer says: "More real bearing value than I can get out of any other bearing."

See interesting exhibit and demonstration of this bearing at Space No. 204, Balcony, Madison Square Garden Automobile Show.

**The New Departure Mfg. Co.**  
BRISTOL, CONN.

Western Branch  
1016-17 Ford Building, Detroit, Michigan



New Departure Single Row



# Lesser Forties Can't Compete With This

Hundreds of dealers, on both sides the Atlantic, have conceded the Michigan "40" this year the topmost place at its price.

And millions of dollars have been staked on this fixed conclusion.

You may be sure that motor car buyers won't differ with this verdict.

## Buyers of "40's"

This year will demand this up-to-dateness.

They'll demand four forward speeds.

They'll want big tires, big brakes and springs, wide seats and ample room.

They'll want electric lights, center control, left side drive. A 22-coated, nickel-trimmed body.

They'll want big over-capacity.

And we are leading them to expect these things at \$1,585—the new Michigan price.

## In a Cameron Car

We are giving these things in a car built by Cameron, who has seen 100,000 of his cars make good.

We are giving a body built by John A. Campbell, who has designed for kings.

We are giving a car in which, in four years, we have worked out 300 improvements. And 6,000 cars have already proved them out.

We give all this, plus all the features named below, for \$1,585.

There are 72 Forties on the market this year. But does any that you know make an offer like this?

## Told to Millions

The Michigan features are being told to the millions, in the greatest advertising campaign of the season.

All men will know them. And the "40" buyers this year will look for cars like this. But such a car at such a price will not be found outside Michigan salesrooms.

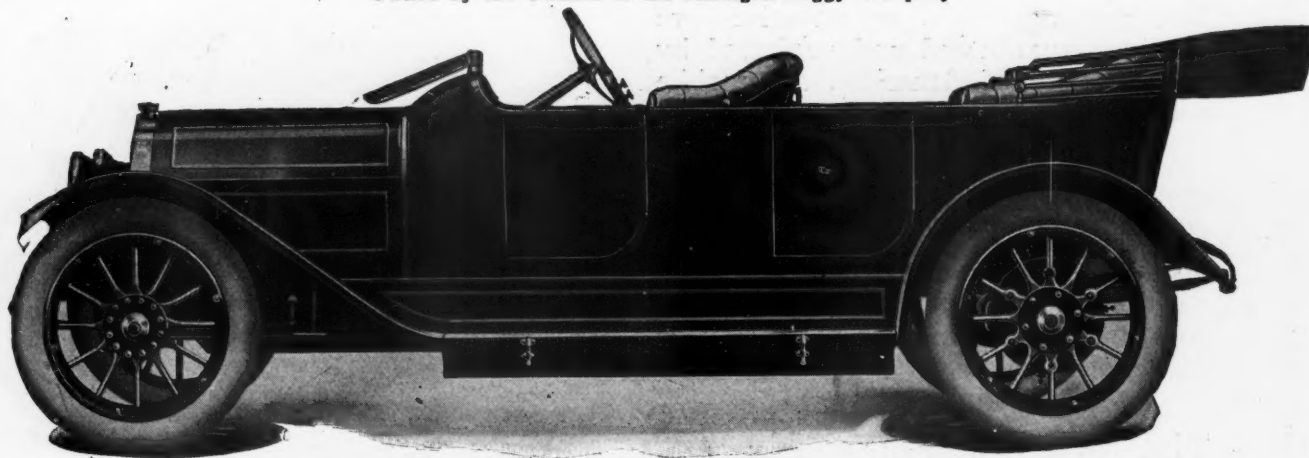
These facts have been proved to hundreds of experts, in Europe and America. They can be proved to you.

We invite dealers and users to send for our catalog, and the facts which they wish to know.

(148)

# MICHIGAN MOTOR CAR COMPANY, Kalamazoo, Michigan

Owned by the Owners of the Michigan Buggy Company



## SOME OF THE MICHIGAN FEATURES

Four-forward-speed transmission  
Oversize tires—35x4½  
Electric lights and dynamo  
Center control—left-side drive  
Motor, 4¼x5¾  
Extra effective brakes—16x2¾ ins.  
Big, comfortable springs  
Adjustable steering post  
Adjustable pedals  
Firestone Q. D. demountable rims—extra rim

14-inch Turkish cushions  
Rear cushions 50 inches long  
Hand-buffed leather upholstery  
Best curled-hair filling  
Wheel base, 118 inches  
Nickel mountings  
Large over-capacity, giving big factors of safety  
Pressed steel, full-floating rear axle  
Axles sufficient for an 80-horsepower car

Genuine cellular-type radiator  
Best mohair top, side curtains and envelope  
Windshield built in as part of body  
Electric horn  
\$50 speedometer, 4-inch dial  
Special foot rail  
Swing robe rail  
Rear tire irons  
Complete tool equipment  
Tool chests under running boards

There is such a difference of opinion about the various types of self-starters that we have not adopted any one type as regular equipment. We prefer to leave this selection to the buyer. We equip with either the gas or a positively efficient electric starter at moderate extra price.

## A 1913 Electric Generator for 1913 Cars

Every motorist demands electric lighting on his 1913 car.

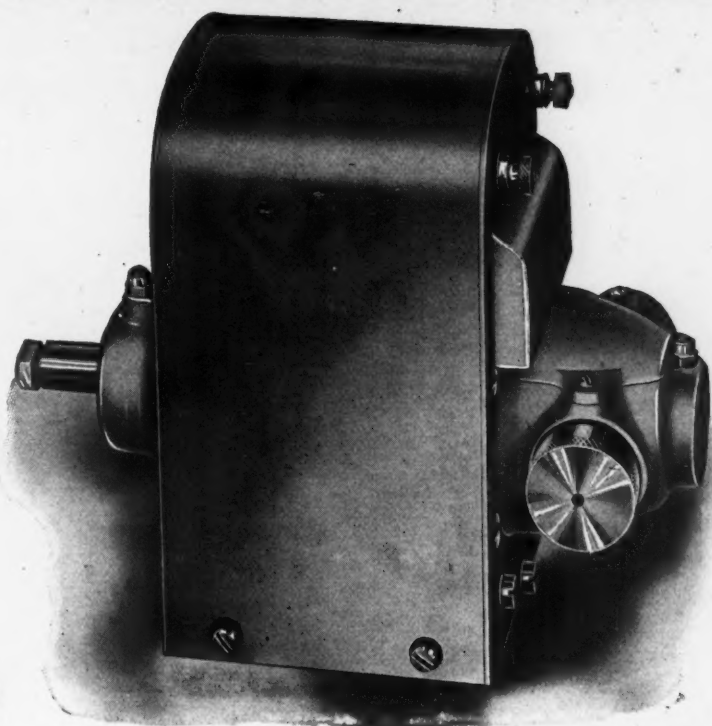
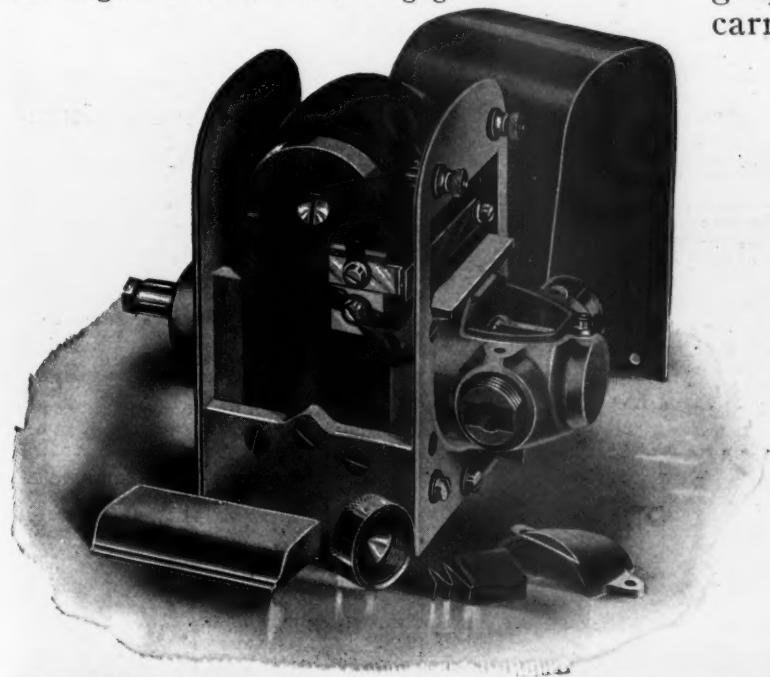
Motorists who don't care to remain behind the times are making their old cars up-to-date, by installing a WELLS GENERATOR—a generator that will outlast any car it's put on.

Up-to-the-minute car manufacturers are meeting the demands of motorists—making 2 sales grow where 1 grew before—by installing the WELLS ELECTRIC LIGHTING SYSTEM on their 1913 products.

### The Wells Generator Is the Most Simple on the Market

It has only 2 moving parts. It contains no special windings nor complicated regulating devices such as friction-drives or rheostats with movable parts. The device is thoroughly trouble-proof because there is nothing about it which can get out of adjustment.

It is as compact as engineering brains can make it. The weight it adds to a car is negligible.



### Built of the Best Material Obtainable

The armature is of highest grade sheet steel, insulated and wound with best double cotton-covered magnet wire. The commutator is of hard-drawn copper bar segments, thoroughly insulated with best mica. High grade silver graphite brushes are of ample size to carry all current produced.

### Current Output Is Auto- matically Regulated

The current production is at all times automatically regulated—there is no altering of the light under high or low speeds. A magnet shunt prevents any damage being done to the battery when the lights are off.

The generator is fully enclosed.

Add a WELLS GENERATOR to the selling points of your 1913 car. Let us send our representative to your factory, or write for prices and details in full.

**R. C. Wells Mfg. Co.**  
Wells Bldg.,      Fond du Lac, Wis.





## "There's Where YOU Are Wise! That Other Fellow is a Menace to Everyone's Safety"

Nine-tenths of all automobile accidents are caused by skidding and by foolish dependence on rubber alone. In these days of crowded streets and congested traffic, the motorist who does not take precaution to guard against every possibility of disaster is **next to criminal**.

"The ever-present danger that is quite as much of a terror to the experienced driver as it is to the novice is **skidding**. There is nothing that makes a man lose his nerve so thoroughly or dread a repetition of the experience so keenly as a bad skid that ends in a broken wheel against a curb, or that makes matters far worse by 'side sweeping' a moving trolley car. To feel the car start to slide from under you, aiming directly at the nearest obstruction, despite all manipulations of the wheel and brakes—well, once is too often."

## Weed Chains vs. Slipshod Traffic

Traffic policemen, by the hundreds, interviewed in all the large cities throughout the country, express the unanimous opinion that their work would be greatly reduced; that nearly all **skidding accidents would be eliminated** if motorists would take the precaution of always carrying **WEED CHAINS**, and putting them on when roads and pavements are wet, slippery and uncertain, or covered with snow.

Some of these **guardians of public safety** go so far as to say that the time is not far off when State Legislatures will make the use of **WEED CHAINS compulsory**, for the protection of life and property.

**MAKE SAFETY YOURS** —take no chances. Fully equip your own car with **WEED CHAINS** and **insist**, for your own protection, that other drivers do the same.

If you haven't a set of **WEED CHAINS**, or if you have a pair for the rear tires only, **get a full equipment now**. Delay is dangerous. Stop at your dealers today and **WEED CHAIN** your car to safety.

For Sale by All  
Reputable Dealers

**WEED CHAIN TIRE GRIP CO., 28 Moore St., New York**

Location at New York Show: Grand Central Palace, Booth No. 427

Madison Square Garden, Booth No. 142

Chicago Show: Booth No. 14

Boston Show: Booth No. F-554

### ON THE REAR TIRES

—they afford perfect traction and adequate brake control.

### ON THE FRONT TIRES

—they act as ladders to enable the front wheels to easily climb out of mud-ruts, car tracks and all uneven places in pavements or roads, always insuring absolute steering control, eliminating all chance of the front wheel skid.



**25%**  
**Fuel Saving**

**MONDEX-HELIX**

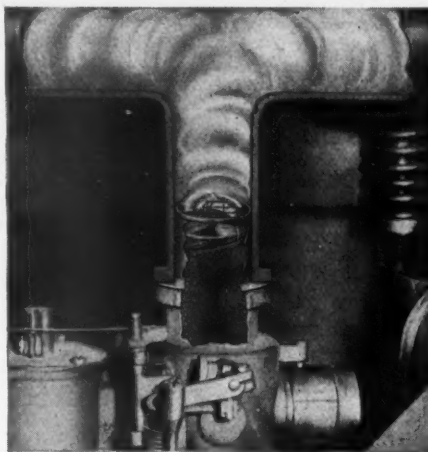
**NO MOVING PARTS  
NEEDS NO ATTENTION**

**100%**  
**Better flexibility**

**12% increase  
at 25 miles  
per hour**

**Increased  
Power  
on Hills**

COAL broken into fine particles makes more perfect combustion and gives greater energy. So does gasoline when passed thru **Mondex - Helix**.



Note how the **Mondex - Helix** inserted in entrance of intake pipe first twists and then grates the lumpy gas into a swirling vapory mass.

**50% increase  
at 10 miles  
per hour.**

**4% increase  
at maximum  
speed**

**EVEN COMBUSTION DOES IT**

Sizes for any Carburetor will be sent by mail with full instructions on receipt of price. 1 in. to 1½ in., \$3.00; 1½ in. to 2 in., \$4.00.

**AGENTS WANTED EVERYWHERE**

**Everywhere on  
High Gear**



**Silent Motor and  
Smooth Pull**

*Exclusive Manufacturing and Distributing Rights*

*Infringements will be rigorously prosecuted*

**THE ARISTOS COMPANY, 246 West 54th Street, New York City**

*When Writing to Advertisers, Please Mention Motor Age.*



**\$985**

F. O. B. Toledo

*Completely  
Equipped***Overland****\$985**

F. O. B. Toledo

*Completely  
Equipped*

## High-priced feature No. 11

Every operation on every part and every assembly of parts of an Overland Model 69T is rigidly inspected at each step in the progress of the car's creation.

After the parts are thoroughly completed and machined ready for assembly they are tested:—

To determine physical properties pertaining to tensile strength, elasticity, hardness, ductility, size, shape, angularity, etc.

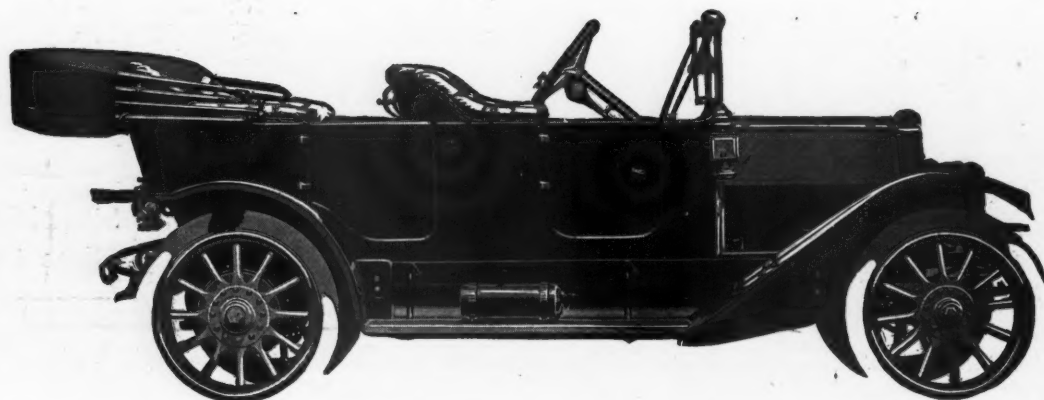
All gears are tested not only for dimensions, but also as to bores and centers. Each single cylinder is accurately gauged, thus assuring interchangeability.

Every camshaft is tested out by means of more special testing equipment. And so it is with every part which goes in the Model 69T.

Such high priced workmanship is available in the 69T for \$985—only because we make 40,000 a year.

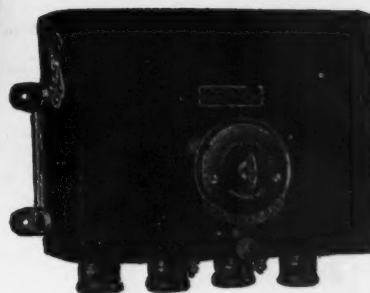
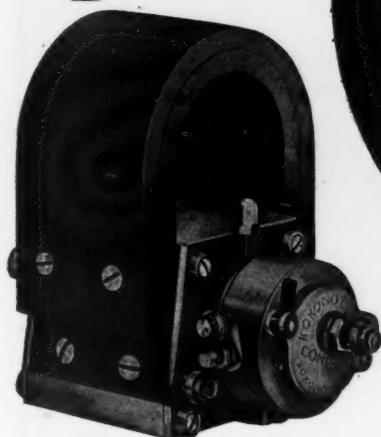
Let us mail you some interesting literature. Please address Dept. 46.

**The Willys-Overland Company**  
Toledo, Ohio



# KINGSTON

## IGNITION SPECIALTIES



### The Leading Member of the Kingston Ignition Specialty Family for 1913 is the Kingston Magneto

KINGSTON Magneto are made in different types for all purposes—for high or low tension currents—for low or heavy duty. They have been universally accepted as "The 1913 Magneto for 1913 Cars."

The complete line of KINGSTON Ignition Specialties includes, spark plugs, make-and-break coils, dash coils, box coils, motorcycle coils and other ignition devices, every one of which is guaranteed to give perfect service satisfaction.

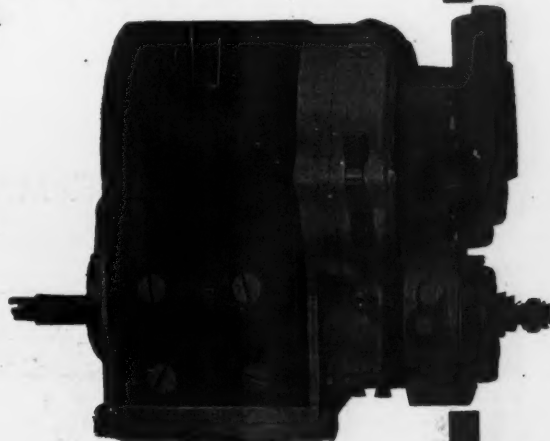
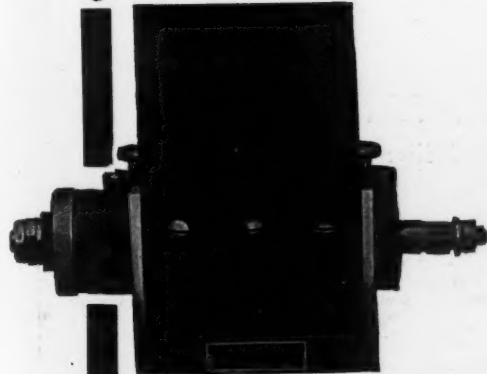
#### WRITE FOR CATALOG

See our exhibit at the New York Show, Madison Square Garden, elevated platform, Space 173, and at the Chicago Show, Coliseum, Balcony, Space 78.

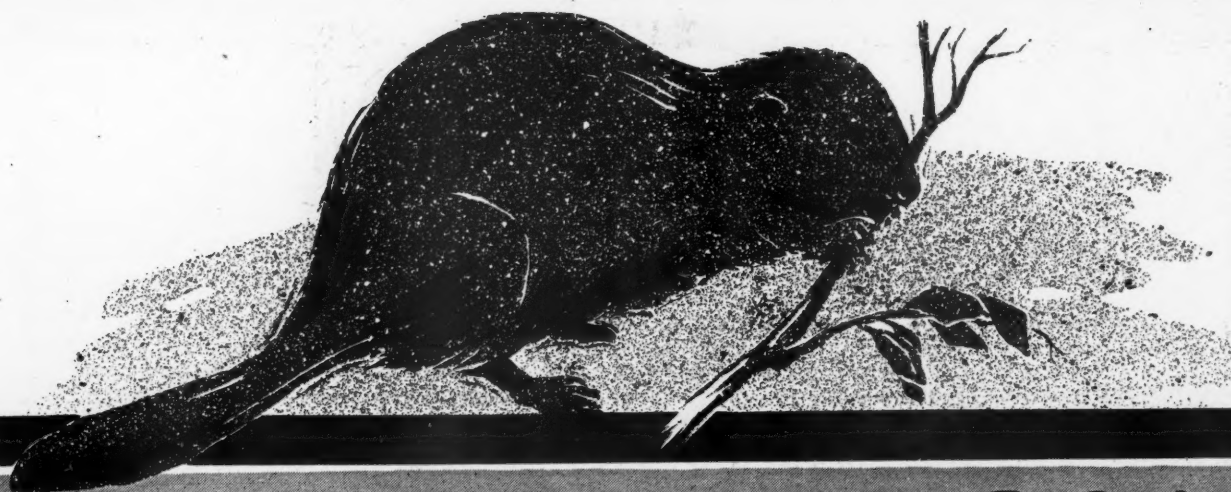
**KOKOMO ELECTRIC COMPANY**  
KOKOMO, INDIANA

#### BRANCHES:

CHICAGO, 1430 Michigan Av.  
DETROIT, 650 Woodward Av.  
NEW YORK, 1733 Broadway  
LOS ANGELES, 804 S. Olive St.







# IT'S A BEAVER!

**Made by Men Who Work 10 Hours a Day, 6  
Days a Week, 52 Weeks a Year  
Making 6-Cylinder Motors**

BEAVER SIX CYLINDER UNIT POWER PLANTS are made by the oldest manufacturers of Six cylinder motors—in one of the largest motor factories in the United States. They are made by men schooled and drilled in the production of Six cylinder motors—veterans who 5 years ago were making BEAVER "Sixes"—firm in the conviction that the "Six" was to be the power plant found under the hood of the car of the future.

These men don't pretend to be authorities on radiators—wheels—bodies—steering-gears—but they do claim to know all about Six cylinder motors!

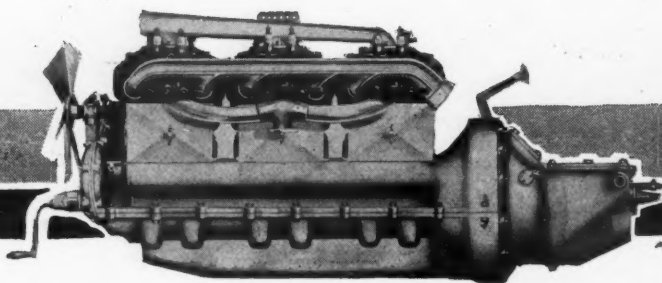
## The Beaver Six Reflects the Proficiency of Its Makers

The BEAVER SIX CYLINDER UNIT POWER PLANT comprises, long stroke (3 3-4 x 5): 3-point suspension; large valves with enclosed action; enclosed fly-wheel; 3-speed transmission; noiseless, vibrationless, oil and dust-tight action, etc., etc. Write us for detailed specifications and delivery schedule.

### BEAVER MANUFACTURING COMPANY

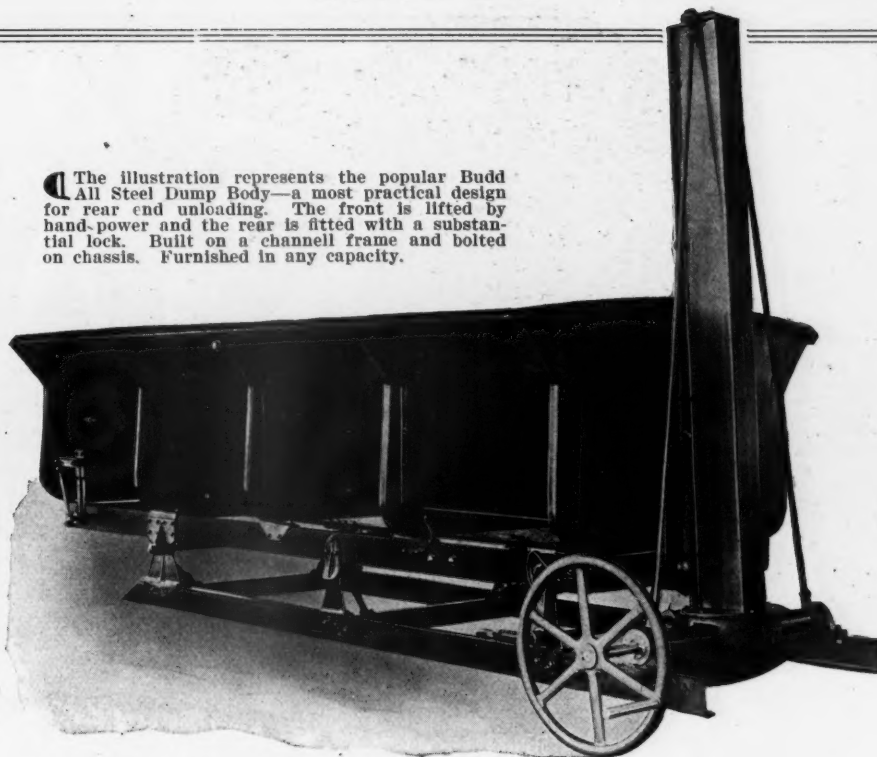
2500 First Avenue

Milwaukee, Wisconsin



*When Writing to Advertisers, Please Mention Motor Age.*

The illustration represents the popular Budd All Steel Dump Body—a most practical design for rear end unloading. The front is lifted by hand-power and the rear is fitted with a substantial lock. Built on a channell frame and bolted on chassis. Furnished in any capacity.



## Put an All Steel Body on Your Truck

PROGRESS is marked by improvement. Evolution is the order of the day. Just as the motor truck has proven its supremacy over the horse drawn vehicle so are Budd's All Steel Vehicle Bodies superseding the ordinary body of wood. The answer lies in two words—"Proven Superiority."

The Budd All Steel Vehicle body is a revelation in truck body buildings. Made of special open hearth steel and worked by the exclusive Budd process, innumerable designs in any style body are possible and the maximum of serviceability, stability and strength is guaranteed.

### BUDD ALL STEEL MOTOR VEHICLE BODIES

are practically indestructible. They are proof against the elements—immune from the ravages of time, wear and tear. They will not warp or crack. They cannot rot or split. Light in weight they are easy on tires.

By use of special machinery each body is worked into shape. All joints are carefully welded. Thus a perfect surface is assured which in turn guarantees the highest quality of "oven baked" enamel finish. A finish that practically becomes an integral portion of the steel and eliminates frequent repaintings.

From a sanitary standpoint alone, Budd All Steel Bodies demand your attention. All corners are made round. There is no chance for the accumu-

lation of dirt. The steel will not absorb moisture, therefore perfect sanitation is possible.

When you stop to consider the fact that Budd's All Steel Bodies represent the height of efficiency in service and durability—that they give you every advantage of the wooden body yet none of its faults, and practically *cost no more than a first-class body of wood*, it is but justice to yourself that you give them a thorough investigation.

Whether you are a manufacturer of commercial vehicles or a prospective buyer of a motor truck, it will pay you to look into this matter now. We have some facts upon "All Steel" Bodies that will prove of vital interest to you. Write for them today.

*See Our Exhibit at the New York Automobile Show*

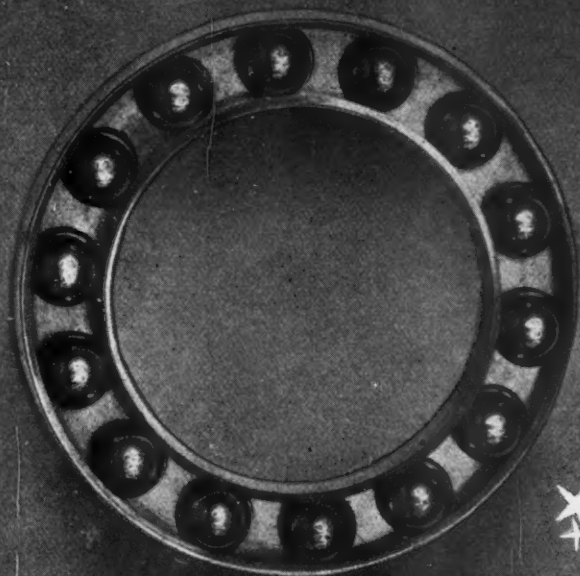
## Edward G. Budd Manufacturing Company

Originators of the ALL STEEL Body for Automobiles and Commercial Vehicles

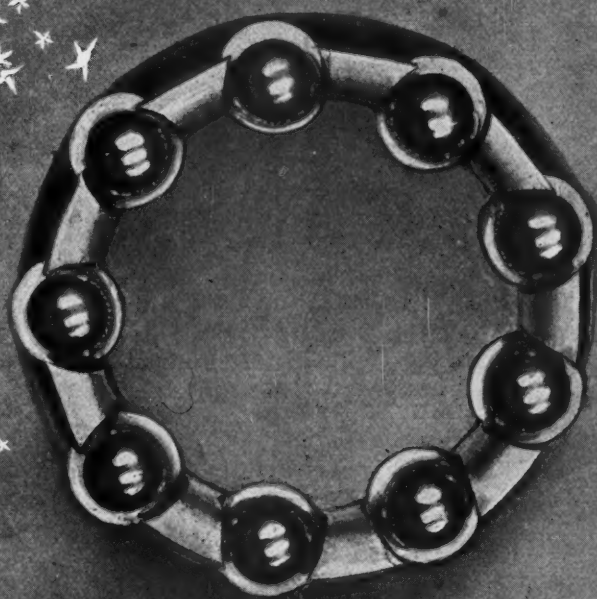
Ontario and I Street, D2

Philadelphia, Pa.





# STAR



## *The famous, perfect* BALL RETAINERS

The perfect ball retainer combines the greatest protection to the balls with the least possibility of derangement.

The possession of both these characteristics explains the superiority of STAR BALL RETAINERS and explains their presence on most high class cars.

Send us a list of sizes.

**STAR BALL RETAINER CO.**  
LANCASTER, PA.

# KLINE KAR

## It's Time To Wake Up, Dealers

**F O R T Y**  
**\$ 1 9 8 5**

**T**HAT'S the magic combination of five letters and five numerals which spells success and adds up the sum of satisfaction to you in this new year, which is bound to see all car sales records smashed to atoms. The **Kline Kar Forty**—with full equipment, including **electric engine starter**, dynamo electric light and four speed transmission—is within your reach at a price which makes further talk idle and useless, for you know it as a four-cylinder forty horse-power creation away beyond the average.

**F I F T Y**  
**\$ 2 5 8 5**

Another quintet of letters and figures, equally as sensational and just as sure to bring you the success for which you have so long been in quest. Let's win together. With these cars in your possession—a **four cylinder forty** at \$1985 and a **six cylinder fifty** at \$2585—both with electric starters—can there possibly be any doubt of a **BIG YEAR**. This announcement means a big flood of telegrams and letters and personal visits from agents everywhere, however, and the rule of first come first served must be obeyed.

### Don't Forget, However, This One Thing

That when you sign a Kline Kar contract you secure the selling rights to two additional cars that complete your line and give you the entree into the presence of every automobile prospect in this country—no matter what his requirements.

The **Kline Kar Model 4-30**, the four cylinder, thirty horse-power car, with the past efficient Ever-Ready automatic engine starter, is a gem of pure richness and quality. A car at \$1750, but with almost unlimited possibilities.

### THE MASTER KLINE KAR

The **Model 6-60**, six cylinder, sixty horse-power seven passenger machine, really a comfortable, cozy, convenient and beautiful home on wheels, at \$3500, with full equipment, including an **electric starter**, and all other Kline Kar features, is once and for all time the final word in motor car construction. It must be seen to be appreciated. These cars will all be at the New York and Chicago Shows.

**SOME TERRITORY STILL OPEN**

**KLINE MOTOR CAR CORPORATION**

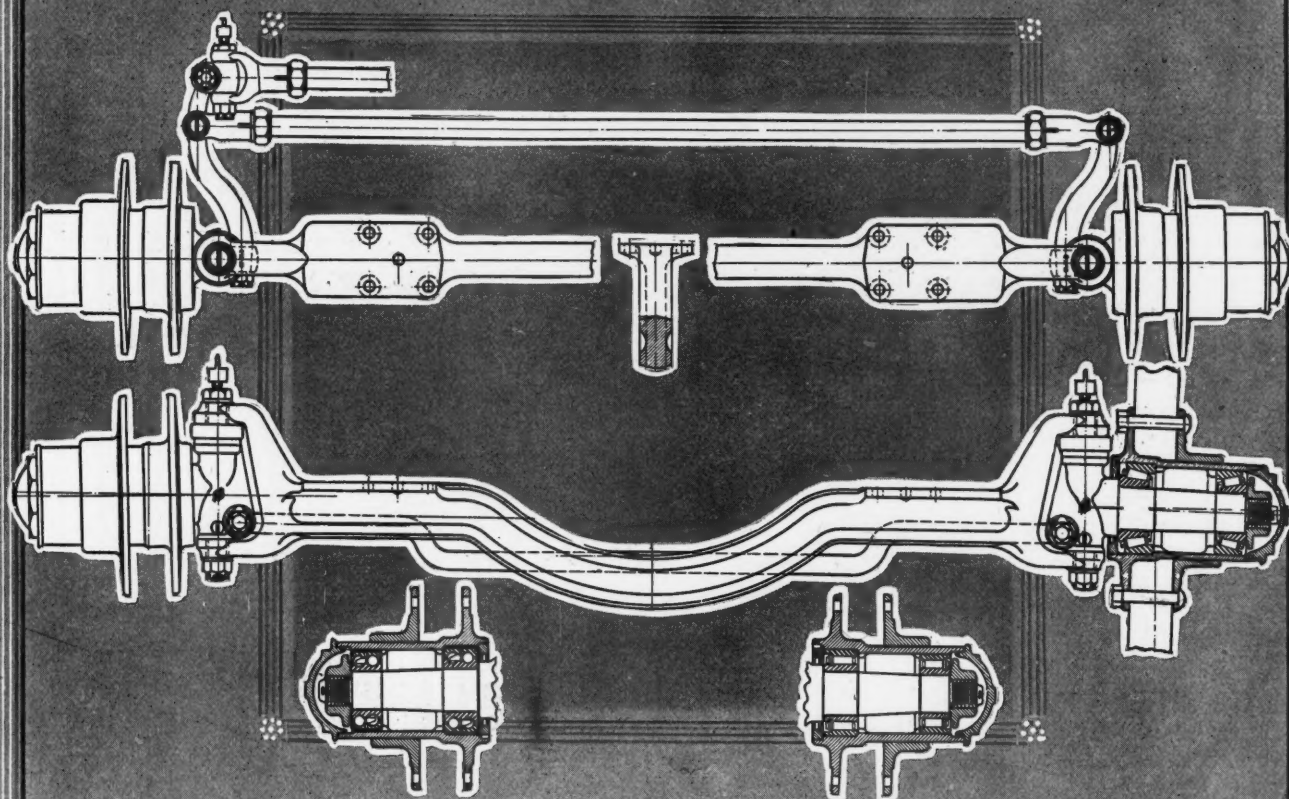
Richmond, Va.

Main Office and Factory, RICHMOND, VA.

York, Pa.



*One of the* **SHELDON** *for Heavy Service*  
FRONT AXLES



Another member of the famous Sheldon line, even more perfect than its predecessors—this is one of the Sheldon Front Axles for heavy service.

No better forging has ever been turned out in any plant. The spring pads are ample in area and are forged integral with the axle. This axle is not welded in the middle. The steering knuckles are reinforced to ensure greatest strength and safety, and perfect lubrication has been attained by efficient oil cups. We offer this axle to manufacturers with their choice of the following bearing equipment:

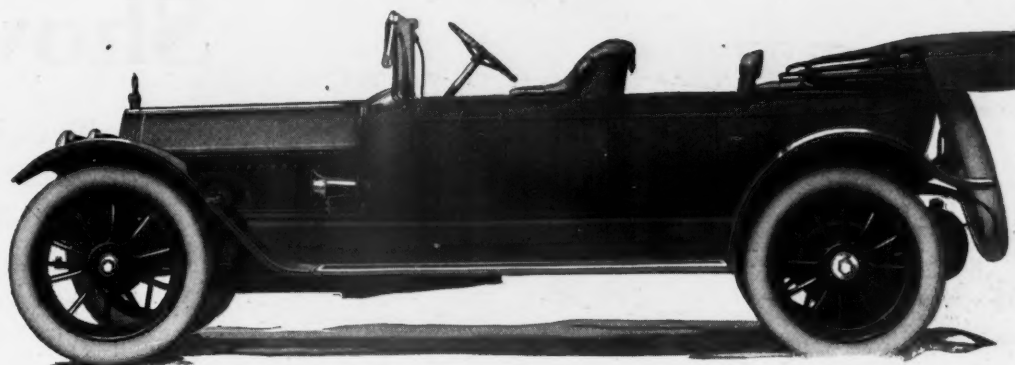
New Departure Double Row Annular  
Standard Taper Roller  
Bower Straight Roller  
Rhineland Double Row Annular  
Any standard double or single row annular bearing  
is interchangeable with these axles and hubs.

**SHELDON AXLE COMPANY, Wilkes-Barre, Pa.**

CHICAGO OFFICE, 68 East 12th St.

DETROIT OFFICE, 1215 Woodward Ave.

# Announcing the New Six-Cylinder STEARNS-KNIGHT



Stearns-Knight Six-Cylinder Seven-Passenger Touring Car

**T**HE new six-cylinder Stearns-Knight is pre-eminently a class car—built for those who demand the utmost in motor car luxury. This of necessity means limited production, and emphasizes the importance of placing orders early if delivery is to be assured.

Chassis in Lead . . . . .	\$4400 and \$4500
Seven-Passenger Touring Car . . . . .	5000
Five-Passenger Touring Car . . . . .	4850
Four-Passenger Light Touring Car . . . . .	4850
Three-Passenger Roadster . . . . .	4850
Limousine . . . . .	6100
Landaulet . . . . .	6200

All six-cylinder Stearns-Knight models are completely equipped with Gray & Davis electric starting and lighting system, Warner Auto-Meter, Mea Magneto, windshield, Klaxon and bulb

**Stearns**  
THE ULTIMATE CAR  
(Knight Type Motor)

horns, silk mohair top with side curtains and slip cover, Q. D. demountable rims (two extra rims), muffler cut-out, robe-rail, footrest, tire-carrier, complete tool and tire repair equipment, etc.



## THE F. B. STEARNS COMPANY

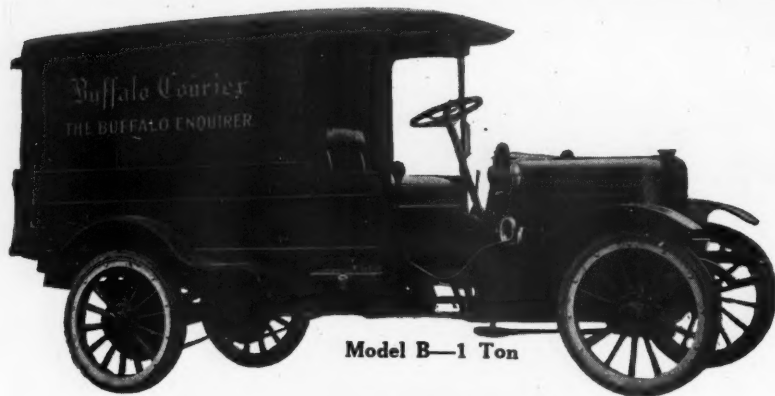
12963 Euclid Avenue

CLEVELAND, OHIO

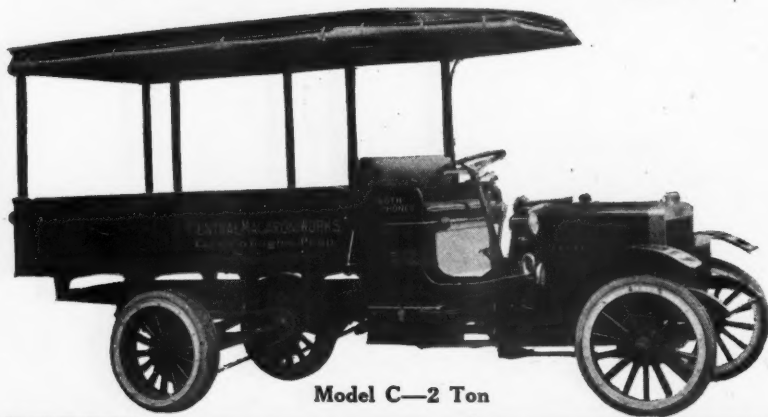
Branches and Dealers in 125 Cities







Model B—1 Ton



Model C—2 Ton

# Sensation of the New York Show

Atterbury Trucks will be shown in the Grand Central Palace, January 20-25, Section A-22. Don't fail to see them. They will also be exhibited at Exposition Park, Rochester, January 27 to February 1, and at Chicago, February 10 to 15.

Atterbury Trucks will be shown in the Grand Central Palace, January 20-25—Section A-22.

**Don't Fail to See Them!**

They will also be exhibited at Exposition Park, Rochester, January 27th to February 1st, and at Chicago, February 10th to 15th.

No matter what the needs of your business, you will find an ATTERBURY TRUCK which will meet with your every requirement in regard to price, size and service. The ATTERBURY Line is the most complete line of commercial cars produced in America.

If you are in the market for a rapid-fire, 1500-lb. delivery wagon, a 1 ton, a 1½ ton, 2 ton, 3 ton or 5 ton heavy-duty truck, business prudence and foresight demand that you investigate the ATTERBURY Line before you make any definite choice. It will pay you in dollars and cents to do so.

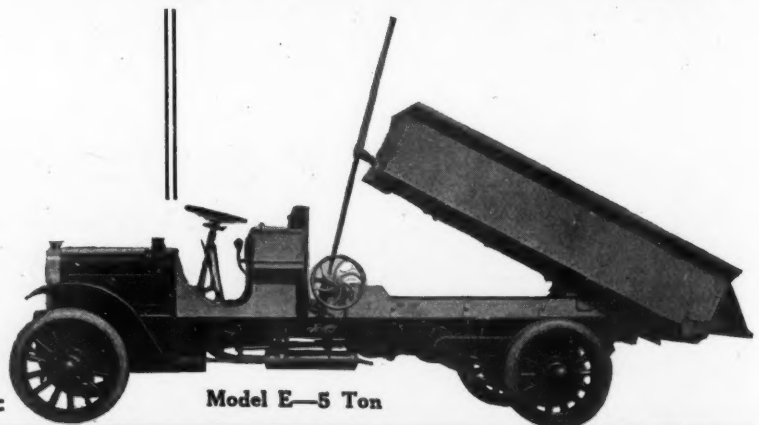
If you cannot personally see this quality line of commercial vehicles, write for catalogue.

*"Atterbury Trucks Deliver the Goods"*

**Atterbury Motor Car Co.**  
Buffalo, :: New York



Model D—3 Ton



Model E—5 Ton

When Writing to Advertisers, Please Mention Motor Age.



MOMENT'S forethought

now

in choosing  
the right bearings  
for your car  
is repaid in  
thousands of miles  
of winged delight  
hours and days  
of time saved  
and many dollars  
of repair economy.

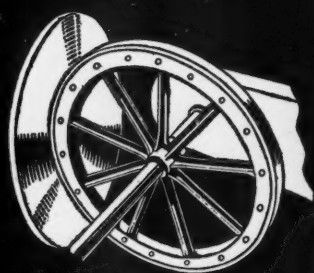
*See that your next car is equipped with*

**HESS-BRIGHT BALL BEARINGS**  
Built for Endurance

**THE HESS-BRIGHT MANUFACTURING COMPANY, Philadelphia, Pa.**

*When Writing to Advertisers, Please Mention Motor Age.*



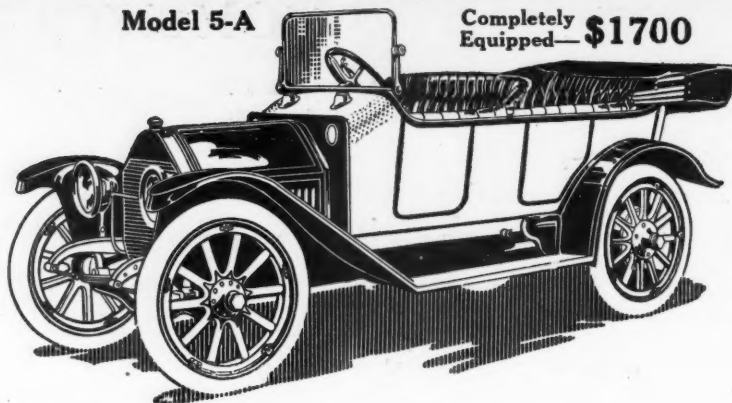


# The Gearless Transmission!

**Cartercar's  
10th Year  
of Success!**

Model 5-A

Completely Equipped—\$1700



**Made Good**—Under every possible condition the Cartercar has answered every requirement of the most particular drivers. No matter whether the roads have been hilly, sandy or muddy, the Cartercar has always given service—the best service.

**Few Changes**—And during this long period of success and ever increasing popularity the big feature of the Cartercar—the Gearless Transmission—has practically remained unchanged. It is the feature of the Cartercar which is largely responsible for the extreme reliability and greater efficiency.

**Power Economy**—This transmission

utilizes the power so completely that the Cartercar will easily carry a full load up a 50% grade—and through deep mud and sand. No gear car can give such valuable service. You take the roads just as they come.

**Unlimited Speeds**—Another splendid feature of this transmission is the unlimited speeds—all controlled easily and silently with a single lever. There is nothing to confuse the most inexperienced driver.

**Greater Tire Mileage**—Many Cartercar owners say that they get about twice the usual mileage from their tires. This is because there are no jerks nor jars. You can easily see

that this must also mean the utmost comfort.

**Electric Starting**—A system of electric starting and lighting that has proven 100% efficient under all conditions is employed in the Cartercar. You merely press a small knob to crank the motor. Turn the same knob and you light all or as many of the lamps as you wish.

**Compare Prices**—When you consider the prices of the Cartercar you should also consider the much greater advantages which it offers. A Cartercar will give the most perfect service over all roads—for any driver—and every day in the year. See these splendid cars before you buy.

**At the Shows—or Ask for Catalog**



## Cartercar Company

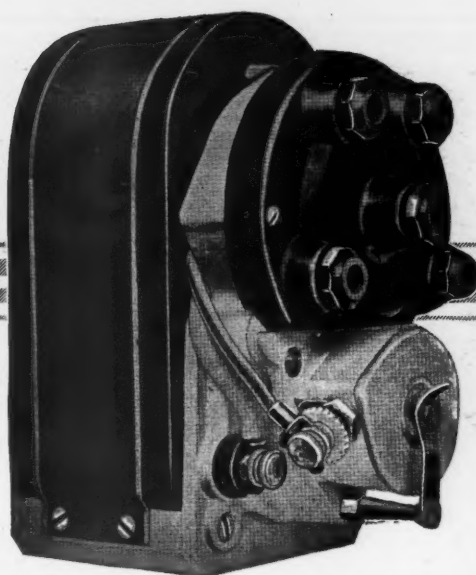
Pontiac, Mich.

Branches:

New York  
Detroit

Chicago

Kansas City  
Atlanta



# Remy

# Magneto

## Chosen by America's leading manufacturers

*More Remy Magnetos are being used on 1913 American Automobiles than all other makes combined.*

**T**HE greatest aggregate board of automobile engineers in the world recommends the use of the new Remy Magneto. This is an expression of the confidence of this country's foremost manufacturers in Remy Magnetos and the facilities of the Remy plant in Anderson, Indiana. It means that factory heads, responsible for returns from financial investments totaling one half billion dollars, put their stamp of approval on the new Remy Magneto. These men are ready to trust their entire 1913 productions and business reputations to the performance of the new Remy.

And these builders in making their choice consulted more than 10,000 automobile dealers throughout the United States. They, too, approved the Remy.

Each of these groups of engineers, manufacturers and dealers feel secure in buying Remy qual-

*Our contracted sales for 1913 are Five Times Greater than in 1912. We ship over 13,000 Remys monthly.*

ity. The engineers know the Remy stood their punishing tests; the manufacturers know the Remy from its inception; the dealers know the Remy as having made good on more than 300,000 cars during the last 15 years. All of these groups know that the Remy is the simplest ignition device made; that this simplicity is backed by Remy Magneto Service for Users, Dealers and Manufacturers.

There are more than fifty Remy branches and service stations located in North American motoring centers for intelligent service to Remy users.

See that a new Remy is on the car you buy.

We have published a simple explanation of magnetos in general and Remys in particular. It is written so that a school boy can understand it. Copy to you on request.

*Exchange your old magneto (any make) for a new 1913 Remy; it will cost you practically no more than repairs on your present ignition system.*

*See the Remy Starting, Lighting and Ignition Exhibit at the Chicago Automobile Show, Space 66, Coliseum, Balcony.*

## The Remy Electric Company, Anderson, Indiana

### Service Stations:

Anderson, Ind.  
Albuquerque, N. M.  
Atlanta, Ga.  
Baltimore, Md.  
Birmingham, Ala.  
Boston, Mass.  
Buffalo, N. Y.

Charlotte, N. C.  
Chicago, Ill.  
Cincinnati, Ohio.  
Cleveland, Ohio.  
Columbus, Ohio.  
Dallas, Texas.  
Denver, Colo.  
Detroit, Mich.

El Paso, Texas.  
Grand Rapids, Mich.  
Houston, Texas.  
Indianapolis, Ind.  
Jacksonville, Fla.  
Kansas City, Mo.  
Los Angeles, Cal.  
Louisville, Ky.

Memphis, Tenn.  
Milwaukee, Wis.  
Minneapolis, Minn.  
Nashville, Tenn.  
New Orleans, La.  
New York City, N. Y.  
Norfolk, Va.  
Omaha, Neb.

Philadelphia, Pa.  
Pittsburg, Pa.  
Portland, Me.  
Portland, Ore.  
Providence, R. I.  
Rochester, N. Y.  
San Antonio, Texas.  
San Francisco, Cal.

Savannah, Ga.  
Seattle, Wash.  
Spokane, Wash.  
St. Louis, Mo.  
Syracuse, N. Y.  
Utica, N. Y.  
Washington, D. C.

Canada—Vancouver, B. C.; Calgary, Alberta; Montreal, Que.; Winnipeg, Manitoba; Hamilton, Ont.; Toronto, Ont.



# Swinehart

## TIRES

Show You How to Save Over  
30% of Your Tire Cost



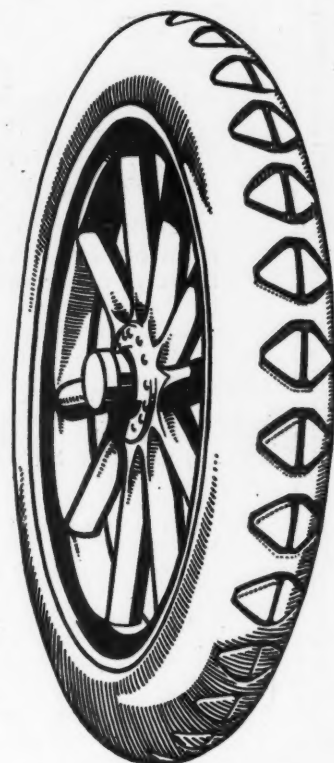
Swinehart Smooth Tread Tires, made by wrapped tread, two cure process, the most approved method.

In Clincher, Q. D. Clincher and Straight Side Types.

They are made of the best materials throughout, which an examination will show, and a test will prove.

This Non-Skid tire (Depression Type) is one that actually makes skidding impossible. The real skidless tire.

This, then, saves the cost of chains, which average 20 per cent of the cost of a casing — in addition to eliminating the chafing and tearing away of 20 per cent of the life of the casing.



### A Total Saving Averaging From 30% to 50%

Thousands in use. Approved and adopted on cabs of seven leading taxicab companies in New York City.

They never skid and they never wear chains.

Four times more wearing surface than any other non-skid. No buttons or projections to cause fabric trouble and their non-skid efficiency is good for two to three thousand miles, two to three times more than you get from others.

All made by the two cure wrapped tread process—the most approved method.

Types—Clincher, Q. D. Clincher, Straight Side.

***It pays to use NON-SKIDS,—GOOD NON-SKID TIRES. SWINEHART NON-SKIDS***

*Exhibit, Elevated Platform, Space 170, Madison Square Garden*

### THE SWINEHART TIRE & RUBBER COMPANY, AKRON, OHIO

CHICAGO.....	1720 Michigan Avenue	NEW YORK.....	1924 Broadway
PHILADELPHIA.....	320 North Broad Street	BOSTON.....	727 Boylston Street
DETROIT.....	286 Jefferson Ave.	ATLANTA.....	11 Houston St.
KANSAS CITY.....	1813 Grand Ave.		

*When Writing to Advertisers, Please Mention Motor Age.*

# SCHAFFER

## Ball Bearings

UNIVERSAL  
IN USE

SATISFACTION  
TO USERS



**M**ANUFACTURERS cannot better introduce their cars to the discriminating public than to say—*they are "SCHAFFER equipped."*

The quality of SCHAFFER BALL BEARINGS has long been established because of their perfect design, their honest construction, and the high quality of their material.

No matter what conditions they may be subjected to, SCHAFFER BALL BEARINGS stand up and give that perfect service which only the highest grade bearings can give.

**BARTHEL, DALY & MILLER**

42 Broadway, New York City



# KINGSTON

## It Will Handle All Grades of Gasoline With Utmost Efficiency and Economy

The new Model Y KINGSTON is especially designed to supply the insistent demands, on the part of manufacturers and motorists, for a carburetor capable of **successfully** handling present-day low-grade gasoline. It is also designed with a view to the utmost **simplicity, compactness and adaptability.**

In principle, design and construction it differs from any other carburetor on the market.

The carburetor is especially designed for **easy starting.** In addition to the choke throttle, placed in the air inlet, which, when closed, produces a very strong suction or vacuum on the spray nozzle, causing a very rich mixture to be drawn, a "well" is placed around the spray nozzle which supplies an automatic reserve for starting. After starting, this "well" has been exhausted, thus insuring none but a properly proportioned mixture.

Another feature is found in the design of the gasoline bowl. It has a generous water or sediment "pocket"—a certain preventive of "flooding."

All the air entering the carburetor is taken from a common source, the air inlet

being located so as to make it very simple and convenient to attach fittings for the conducting of warm air to this intake point.

In the top or body casting of the carburetor, the openings and areas thereof are so arranged that the effect produced shows the same action as an "automatic, expanding venturi," which positively insures a thorough saturation of all air and gasoline in the proper proportions to produce a perfect mixture before leaving the carburetor.

The supplemental air supply for higher motor speeds enters the mixing chamber through five bronze ball valves **automatically** controlled by motor suction.

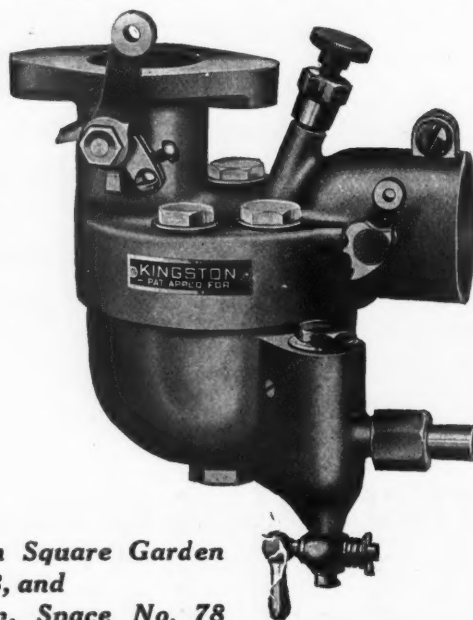
*Write us for Complete Details*

**BYRNE, KINGSTON  
& COMPANY**

**KOKOMO INDIANA**

#### BRANCHES

CHICAGO, 1430 Michigan Avenue  
DETROIT, 650 Woodward Avenue  
NEW YORK, 1733 Broadway  
LOS ANGELES, 804 So. Olive Street



**See our Exhibit at the Madison Square Garden  
Show, Space No. 173, and  
at the Chicago Show, Coliseum, Space No. 78**

# WARNER

Who's  
Who



And  
Why

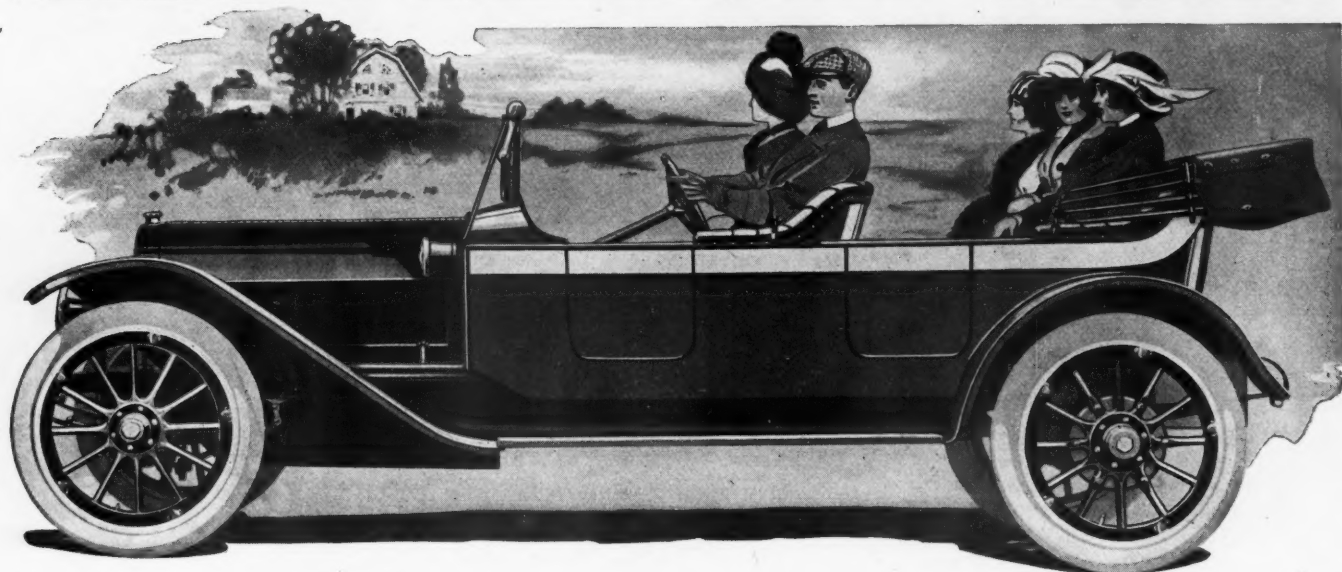
THE WARNER MANUFACTURING CO.  
TOLEDO, OHIO, U. S. A.

T. W. WARNER, Pres.—Gen. Mgr.

# TOLEDO



# Your Motor Car!



**Center Control**  
**Electric Starter**  
**Electric Lights**  
**Electric Horn**

*Nyberg*

**Six \$2000**  
**Four \$1595**

YOUR MOTOR CAR is a stylish, comfortable car—one which any man may well be proud to own. A valuable addition to any dealer's line

## **YOUR MOTOR CAR Represents Real Value**

It is not another sensation of the automobile world; it is not the car for which thousands have been waiting; it is not better than any car selling for twice as much.

Your Motor Car is just a beautiful, powerful car, designed by an engineer who has been identified with the automobile industry in America for fifteen years; built under his direction by an organization which has been trained to do things right at the lowest cost.

This engineer is Henry Nyberg, a graduate of the famous technical school at Malmo, Sweden; a practical mechanic who has worked out a plan by which you can buy Your Motor Car for at least 10 per cent less than any other car of equal value.

This plan is based on conditions as they exist today. The automobile business has changed radically during the past few years. Certain features have been adopted as standard, so that it is no longer a difficult problem to determine the value of a motor car. Your Motor Car measures up to these standards in every way.

## **REAL MOTOR CAR VALUE Is Determined by Many Factors**

There are many good motor cars on the market now, but some of them offer you much greater real value, proportionate to the selling price, than others. A car may be right in every particular—design, material and workmanship; it may be manufactured in a modern factory; it may be sold at a reasonable profit—and still not be good value for the money.

The one big factor entering into the question of real value in a motor car—a point which many people overlook—is the conditions under which the car is built.

A car manufactured in a million dollar factory located on valuable land must have included in its selling price a share of this big investment. A car manufactured where living and labor are high must stand its share of that expense.

Your Motor Car is built in a town where labor conditions are unusually good; in a plain, substantial factory, designed for producing automobiles economically. The overhead expense on Your Motor Car is much less than that which most motor cars have to stand, and we are giving you the benefit.

## **YOUR MOTOR CAR Itself Is the Proof**

You have read many glowing statements regarding cars of all kinds, ranging in price from \$500 to \$5000. We could use a lot of superlatives in describing Your Motor Car, but it is not necessary. The car itself is the best proof we can offer of its unusual value.

Satisfy yourself on this point before you put up any money. Compare our car with others, selling at about the same price, bearing in mind that "Your Motor Car" is listed with complete equipment, including electric starter, electric lights, electric generator and storage battery, electric horn, top, windshield, speedometer, five demountable rims, nickel trimmings throughout, etc.

You should also bear in mind that the Nyberg SIX is a proven SIX, now in its third successful season. This is a point you should consider carefully when looking over the SIXES being offered for 1913. To be in line you want a SIX, but you cannot afford to take a chance on an experiment, and you will find that most of the medium priced SIXES are experiments.

Literature describing the different models will be sent on request

**NYBERG AUTOMOBILE WORKS**

Northern Factory: Anderson, Indiana Chicago Branch: 2437-2439 Michigan Ave. Southern Factory: Chattanooga, Tenn.

When Writing to Advertisers, Please Mention Motor Age.



Show Exhibits as follows:  
 Madison Square Garden  
 (New York), No. 157.  
 Grand Central Palace  
 (New York), No. 205.  
 Coliseum (Chicago), No. 12.  
 Boston, No. E-431.

## How the U-S-L Storage Battery Converted a City of Hills

PITTSBURGH is known as one of the hardest communities in the country on electric vehicles. Two or three years ago transportation by this means was regarded as impracticable in that city on account of the hills and general traffic difficulties.

The people had to be shown. The **U-S-L** Storage Battery did it. By its remarkable power maintenance and sustained voltage capacity it *proved* to Pittsburgh that, with the *right* battery, electric transportation is the economical, dependable and clean method for either commercial or pleasure uses.

The result was that last year hundreds of electric vehicles were sold in the Smoky City and 75% of them were equipped with **U-S-L** Batteries. In spite of the number and steepness of the hills and rough streets, these batteries are giving 65 to 70 miles on a charge, with far longer life than the ordinary battery gives under such conditions. Users consider that the **U-S-L** Battery is about 25% more efficient than any other battery on the market.

This Pittsburgh story is one of the greatest reasons in the world why you should *specify* that your electric truck or pleasure car be equipped with **U-S-L** Batteries. On all renewals get **U-S-L** plates. A battery that makes good on hills makes good on the level.

### U-S-L Service

stands back of every installation, bringing the services of trained experts, who co-operate with users to secure maximum efficiency. These men operate from stations in eight principal cities, where spare parts are always on hand. Write us or use the coupon for information.

### The U. S. Light & Heating Company

General Offices:

30 Church Street, New York

Factory:

Niagara Falls, N. Y.

Branch Offices and Service Stations:

Chicago, New York, Boston, Cleveland, Buffalo, San Francisco, Detroit, St. Louis

Manufacturers also of the U-S-L Electric Starter and Lighter for Gasoline Automobiles



The United States Light & Heating Company  
 30 Church Street, New York, N. Y.

Gentlemen—Please send me the U-S-L Bulletins checked below:

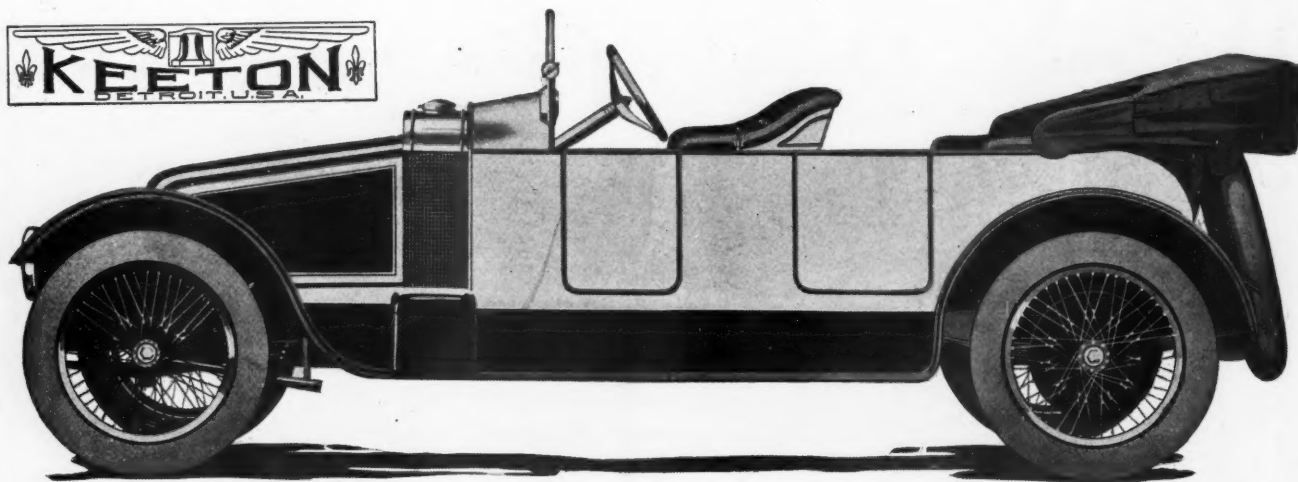
- ☐ 1. Power for Electric Vehicles—Pleasure and Commercial.
- ☐ 2. Electric Light for Railroad Cars.
- ☐ 3. U-S-L Storage Batteries for Stationary Service.
- ☐ 4. U-S-L Storage Batteries for Independent Electric Lighting.
- ☐ 5. U-S-L Electric Starter and Lighter for Automobiles.
- ☐ 6. U-S-L Sparker and Automobile Lighter Batteries.

[NOTE—With the bulletins will go forward the U-S-L Book illustrating and describing the U-S-L facilities, service and products.]

Name.....  
 Street.....  
 City.....State.....

When Writing to Advertisers, Please Mention Motor Age.





## Great Success at Importer's Show— Even Greater at the Palace!

Never before was an American car exhibited at the Astor Show. And the Six "48" Keeton was the big attraction there, because it proved conclusively that a car could be produced in America, offering the same features—the same quality of the high priced foreign cars—and still be sold at the reasonable American price. Then at the Palace it was again the sensation because it was the only real foreign type of car on exhibition there.

### Real French-English Type

The Six "48" Keeton combines the very best ideas of designing and engineering found in the leading cars of both France and England, and adapts them to the road and touring conditions of this country. But it comes to you from an American factory—without the high duty—that's why the price is so low in comparison to the imported cars.

### The Utmost Service

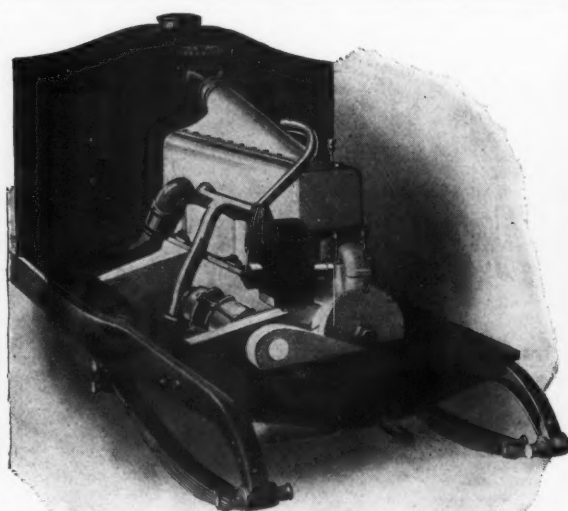
And extremely reliable and powerful, long stroke motor—light body, car complete weighing only 3350 pounds—transmission of the most modern and efficient type, and other excellent features insure you the very best possible service from the Keeton.

### Comfort in Riding

The upholstery is unusually deep—the springs are very resilient, offering the greatest comfort, even on the longest trips. The Keeton glides along silently, smoothly, giving you the utmost enjoyment of every mile you drive.

Three excellent models, ranging in price from \$2750 to \$3000, with Electric Starting and Lighting System and complete equipment. If you want a real foreign type of car—in style and service as well—then you should consider the Keeton, the only American made foreign type. Booklet on request. Will exhibit also at the Chicago and Detroit Shows.

**Keeton Motor Company**  
Detroit, U. S. A.



**Note the Clean Motor**  
**All Models 131-inch Wheel Base**  
**Electric Starting**  
**Electric Lighting**  
**Wire or Wood Wheels**  
**Cars Completely Equipped**

The One Certain Way  
To Obtain Tire Quality

USE

# AJAX TIRES

*Guaranteed for 5000 Miles*

It's the easiest thing to claim Tire Quality  
But We Guarantee It.

**Ajax Tires mean—**

- 30 per cent more mileage than other standard tires at no greater cost
- 5000 miles (written guarantee) vs. 3500 miles (verbal guarantee) a saving of from \$4 to \$20 on each tire
- Value and satisfaction that come with decreased tire cost and increased tire service.

*Thousands of Motorists are Practicing True Tire Economy. Are you?*

**Dealers Everywhere**

have found the Ajax Proposition an unfailing trade winner. Our literature is an education in tire making and selling. Send for it today.

*Exhibiting At New York and Chicago Shows*

**AJAX-GRIEB RUBBER COMPANY**

General Offices: 1796 Broadway, New York City

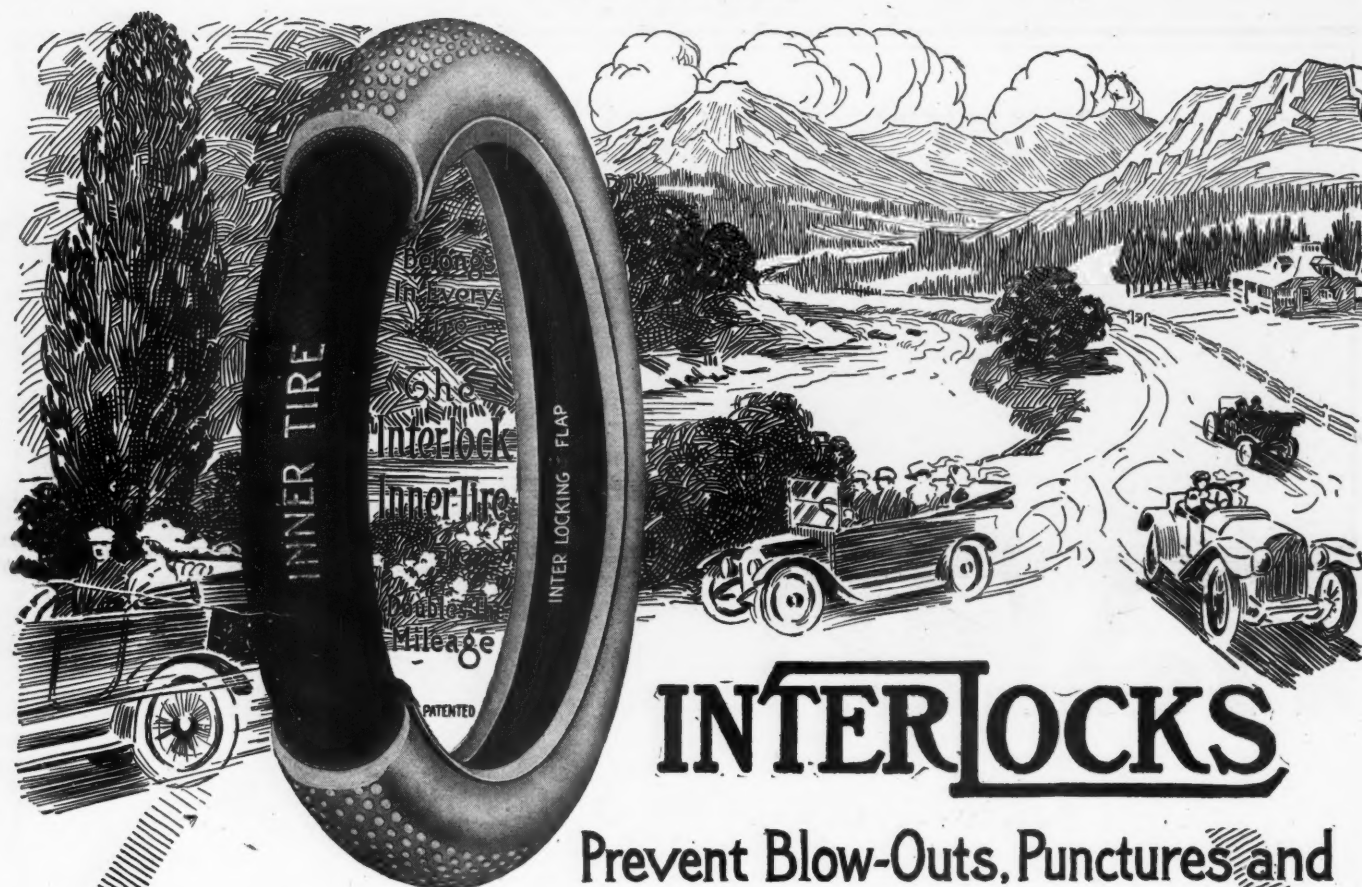
Factory: Trenton, N. J.

Branches in All Principal Cities



Safeguard Your Winter Motoring  
With AJAX Extra-Heavy Non-Skid  
Tire. The Only Non-Skid Guar-  
anteed for 5000 Miles.





# INTERLOCKS

## Prevent Blow-Outs, Punctures and Double Your Tire Mileage

If you really believed this you would order a set of Interlocks for your car at once. We can prove our statements if you will give us the opportunity. Thousands of car owners are using Interlock Inner Tires with the most satisfactory results. A set of Interlocks will carry most any car one or two seasons (according to use) without tire trouble.

**What Interlocks Are** Interlock Inner Tires are complete endless inner tires (not inner shoes) quickly and easily placed between the outer casing and the inner tube. They strengthen the casing and protect the inner tube from punctures. The patented Interlock Flaps lock the Interlock securely, making it an integral part of the whole tire that flexes perfectly and cannot chafe, creep or heat. Interlock Inner tires will hold even if the outer casing is broken, and can be used in old or new tires. They double the mileage of new tires and add 1,000 to 5,000 extra miles to old ones. Interlocks have a fine gray rubber finish, are smooth outside and inside and have no troublesome ends, joints or edges to cement. Interlocks do not affect the resilience of your tires—are easy to insert and can easily be removed from one tire and placed in another.

**Proved best by Road Tests** Interlock Inner Tires have stood the exacting test of hard road work. Eight tires equipped with Interlocks have made over 7,000 miles each, a total of 56,000 miles, without a blow-out or any tire trouble. Interlocks used in tires that have gone 10,000 miles with the outer casings worn clear through have kept up with fast cars equipped with new tires and carrying extra tires. Interlocks have made a 4,500 mile cross country run—the last 1,000 miles over 20 mountain ranges without a blow-out or even carrying an extra tire. In the Four States Run Interlocks stood the test of hard fast road work under the critical observation of tire experts, without tire trouble. These and other hard public tests have proved the efficiency of Interlock Inner Tires beyond question.

## 90% of All Tires are Scrapped Before the Rubber Tread is Half Worn Out

because the fabric is not strong enough to resist hard road work, resulting in blow-outs, punctures, rim cuts, etc. The liberal excess fabric strength of tires equipped with Interlocks prevents blow-outs, punctures, etc., gives extreme long mileage, safety, and that freedom from tire trouble which every car owner desires.

**Write for Our Booklet** Send us your address and let us mail you our booklets, data and testimonials of users which are very convincing. Interlocks are sold by the best dealers everywhere. Ask your dealer about them.

**To Dealers and Agents** Any dealer can do a large business by telling car owners about Interlocks. We want a live dealer in every town, and give positive selling assistance. Write promptly for booklet and our dealers' proposition.

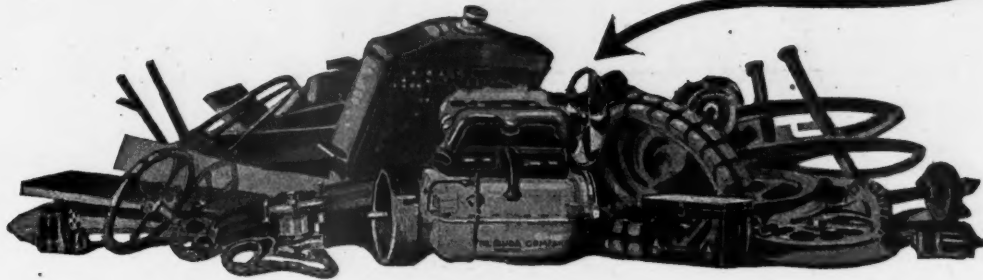
See our Exhibits at New York, Chicago and Boston Shows

**DOUBLE FABRIC TIRE CO.**

128 9th St., Auburn, Ind.

When Writing to Advertisers, Please Mention Motor Age.

# Unscramble Your Truck and what have you got but this?



**Mr. Careful Buyer**—select your truck the way the sharp trader bought his horse in those bygone days of Horse Trading—in the “knocked-down” fashion—a *combination* of so much sound legs+healthy teeth+sound stomach+unimpaired wind+style, etc.

**Buy your Truck as an “assembly of accessories”**—a reliable chassis and springs+an efficient motor+a flexible carburetor+a dependable magneto+a pleasing appearance, etc.

**And remember that as a “horse is no stronger than his stomach” so A TRUCK IS NO BETTER THAN ITS MOTOR.** (There's only one moral—Get a BUDA!)

Many a Truck is being sold today because the **Salesman** appreciates the **Selling Power** and the **Buyer** appreciates the **Service Value** of having a

## BUDA MOTOR

Beneath the Hood

That prominent manufacturers look at the Buda (with its special oiling device, and exclusive “get-at-ability”) not as *a part of the Truck to Sell* but *The Part that helps to Sell the Truck*, is evident by the following partial list of manufacturers to whom we have sold motors.

### Pleasure Cars:

Hudson Motor Car Co.	Spaulding Mfg. Co.
Michigan Motor Car Co.	Oroxton Motor Co.
Henderson Motor Car Co.	Nova Scotia Carriage and
Lenox Motor Car Co.	Motor Car Co.
Schacht Motor Car Co.	Miller Motor Car Co.
and others	

### Trucks:

Service Motor Car Co.	W. Landshaft & Sons
Bowling Green Motor Car Co.	Harvey Motor Truck Co.
Durant-Dort Carriage Co.	Hariburt Motor Truck Co.
Hewitt-Ludlow Auto Co.	Schacht Motor Car Co.
Tiffin Wagon Co.	Chicago Pneumatic Tool Co.
Brantford Motor Truck Co.	Lord Baltimore Motor Car Co.
U. S. Government and others.	

## The Buda “Little Six”

will be ready for delivery by April first and is a product worthy of the Company which was the Pioneer of the “Cast-in-Block” method in U. S.

### SHOW NOTICE:

We have spaces at all 3 of the 13th Annual Automobile Shows as follows:  
Grand Central Palace, New York, January 11th to January 25th. Space No. 304, located in the Balcony.  
Madison Square Garden, New York, January 11th to January 25th. Space No. 326, located in the Concert Hall.  
Coliseum, Chicago, February 1st to February 15th. Spaces Nos. 102, 103, 104, located in Coliseum Annex, 2nd floor.

Send for Special Bulletin to

### BRANDENBURG & COMPANY

1108 So. MICHIGAN AVE.  
CHICAGO

57TH AND BROADWAY  
NEW YORK CITY

FORD BUILDING  
DETROIT

### 1913 Specifications

for Hyduty Commercial Motors:

Model “M” Motor, 3¼ x 4¼  
Model “Q” Motor, 3¼ x 5¼

Long Stroke. Enclosed Valve.  
Noiseless Timing Gears, Self-contained Oiling System. Extra large Valves and Bearings. Ample water jacket.





## **“Auto-Lite” Electric Starter**

*Manufacturers*

*Dealers*

*Car Owners*

**W**E would greatly appreciate an opportunity to explain to you the details of our “Auto-Lite” electric starter and lighting system at our booth, No. 309-B, Concert Hall, Madison Square Garden, the week of the Pleasure Car Show, January 11th to 18th. We are positive it would be to our mutual advantage.

**THE ELECTRIC AUTO-LITE COMPANY**

**MAIN OFFICE AND FACTORY, TOLEDO, OHIO**

**Branch Offices:**

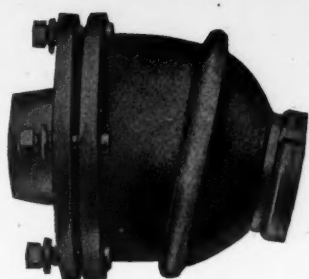
**New York**

**Kansas City**

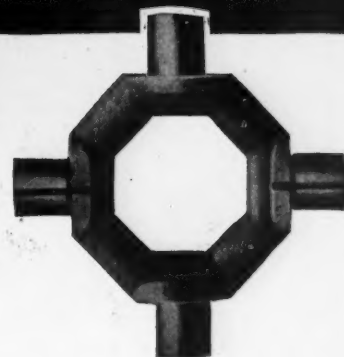
**San Francisco**

Universal Equipment for High Class Cars

# Spicer Universal Joints



**OIL TIGHT  
DUST PROOF**



"SPICER" Universal Joints are recognized as the Standard for American Cars. There is a reason for SPICER superiority. We have our own Drop Forging Plant and are therefore able to control the quality of steel in our Drop Forgings. The competent workman and strict inspection standards in our machine department insure a finished product whose accuracy and strength have created the slogan. "SPICER" is Quality.

**DOMESTIC REPRESENTATIVES:**

K. Franklin Peterson...122 So. Michigan Blvd., Chicago  
Thos. J. Wetzel.....17 West 42nd St., New York  
L. D. Bolton.....1810 Ford Bldg., Detroit

**FOREIGN REPRESENTATIVE:**

Benjamin Whittaker.....21 State St., New York

**Spicer Mfg. Co.  
Plainfield, N.J., U.S.A.**



# Rudge-Whitworth Detachable Wire Wheels

fitted with  
**Houk QUICK DETACHABLE Rims**

**R**UDGE-WHITWORTH Detachable Wire Wheels have won the endorsement of motorists both at home and abroad, not because they are wire wheels, but because they are wire wheels scientifically made from the best materials.

Every Rudge-Whitworth spoke is carefully tested for tensile strength, before it goes into the wheel. The tension to which the wheel is being subjected is then learned, and every spoke trued up and adjusted to meet the strain.

No scientific instrument could be made with greater care than is used on the seventy different suspension points of Rudge-Whitworth Detachable Wire Wheels.

No wonder they can't be broken.

No wonder they make smooth running cars.

No wonder they cut about 60% off your tire expenses.

They are now being made by the Standard Roller Bearing Company of Philadelphia, and are equipped with the famous Houk Quick Detachable Rim, the best quick detachable rim on the market.

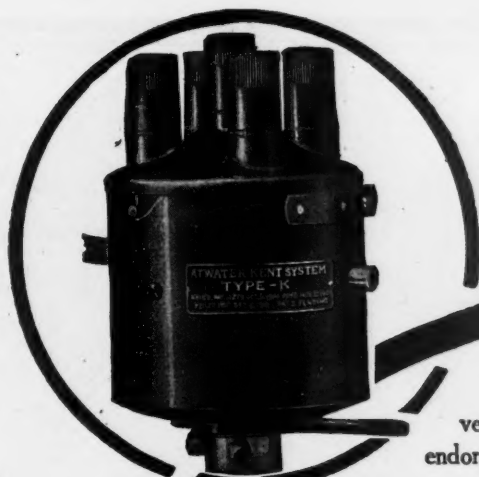
*Absolutely Rustless*

**George W. Houk Company**

**5002 Lancaster Ave.**

**PHILADELPHIA, PA.**

# The Atwater Kent Ignition System



has been silently advertised from coast to coast by the best advertisement any product can have—the personal endorsement of over 100,000 satisfied motorists.

During the period of the magneto craze, we could have taken advantage of this fad and manufactured magnetos. Due to our facilities and prestige, we could undoubtedly have produced and sold large quantities of them. We knew, however, that the Atwater Kent System was fundamentally correct in principle and that it was better than any other ignition device. This opinion was also shared by thousands of our friends who discarded the magnetos on their new cars and installed the Atwater Kent, claiming they got much better results with much less trouble.

You can't equip your car with a more reliable ignition system than the Atwater Kent—no matter what amount of money you are willing or expect to pay for it. Why then take chances by investing in other equipment when by installing the Atwater Kent System you close every avenue to future regret?

Just a few of the many good features of the Atwater Kent System and its advantages over the magneto:

The spark is of constant heat quality irrespective of the speed of the engine, thereby enabling the engine to be run at a very much lower speed if desired.

The simplicity and accessibility of the different parts of the Uni-Sparker are much greater than in the case of the magneto.

The adjustment of the platinum contacts does not affect the timing of the spark.

Easy adjustment to lengthen or shorten the spark, thereby insuring the maximum economy of battery current.

Low maintenance cost and repair expense. Will start engine on spark. Duplicate ignition system not necessary. Light weight.

No magnets to become demagnetized. Unlimited range of spark advance or retard. Low initial cost.

In connection with the standard Type F System, we are furnishing a new model—Silent Type K with automatic spark advance and insulated primary circuit, especially designed for use in connection with lighting and starting equipment.

## PRICES OF THE TYPE F SYSTEM

	Standard Coil	Kick Switch Coil
1-cylinder	\$17.00	
2-cylinder opposed	18.00	
2-cylinder distributor type	22.00	\$24.00
3-cylinder distributor type	25.00	27.00
4-cylinder distributor type	25.00	27.00
6-cylinder distributor type	27.00	29.00

## PRICES OF THE TYPE K SYSTEM

	Standard Coil	Kick Switch Coil
2-cylinder	\$32.00	\$35.00
3-cylinder	35.00	38.00
4-cylinder	35.00	38.00
6-cylinder	37.00	40.00

If you have an unsatisfactory magneto, or if your engine has no timer shaft, you can use the Atwater Kent System by means of a special "magneto gear mounting," the cost of which is \$5.00 in addition to the above prices.

*Possibly all that car of yours needs to give perfect service is an Atwater Kent Ignition System.*

*Our booklet, "A," is as interesting as it's free—yours for the asking.*

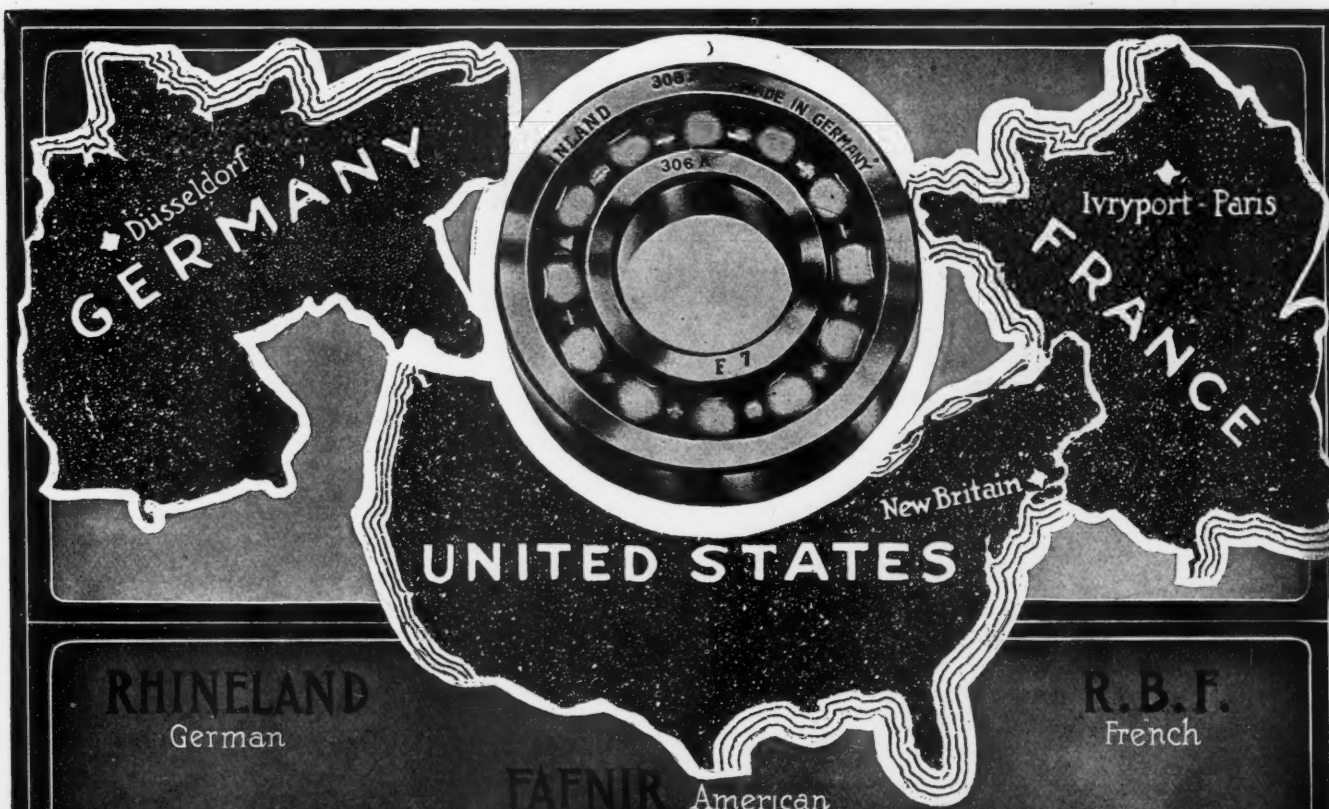
See our Exhibits  
Space 140 Madison Square  
New York  
Space 8, Coliseum, Chicago

**ATWATER KENT MFG. WORKS**  
4934 Stenton Avenue, Philadelphia

*When Writing to Advertisers, Please Mention Motor Age.*







**RHINELAND**  
German

**FAFNIR** American

**R.B.F.**  
French

*Insurance for Builder & User*  
*Universal Use & Reputation*

FACTORIES IN THREE COUNTRIES

**Strikes, Fire, Flood or War**  
**Cannot Stop Deliveries.**

**A FEW USERS OF THESE BEARINGS**

PEUGEOT  
PANHARD & LEVASSOR  
DELAHAYE  
DELAUNAY-BELLEVILLE  
RENAULT  
ESTABLIS HOTCHKISS  
AUTO-METALLURGIQUE  
SCHNEIDER  
ISOTTA FRASCHINI  
CLEMENT-BAYARD  
CADILLAC  
MERCER  
PEERLESS  
KISSEL KAR  
LAUTH-JUERGENS

SEAGRAVE  
MICHIGAN BUGGY CO.  
PULLMAN  
NATIONAL  
MOON  
GRAMM  
AMERICAN  
DAIMLER CO., COVENTRY  
USINES PIPE  
GEBRÜDER STOEWER  
ADLERWERKE  
CIE. D'AUTO FIACRES  
NAGANT FRERES  
CALTHORPE  
MINERVA MOTORS

**RHINELAND MACHINE WORKS CO.**

140 West 42nd Street, New York

# The Ward Leonard System

## With Real Automatic Control



The perfection of the Ward Leonard System is due to the fact that Ward Leonard experience is electrical and mechanical experience combined.

The latest and best forms of heavy electric hoisting machinery are operated under Ward Leonard Systems of control. Hoists which employ as high as 1500 H. P. and which are driven vertically at the rate of 40 miles an hour are perfectly controlled by Ward Leonard Systems.

This control results in a marked increase of the output, greater economy, and absolute safety.

Steel rolling mills in Germany alone save millions of dollars because their immense rolls, a single set of which frequently requires 12,000 H. P. to operate, are electrically controlled by Ward Leonard Systems.

It is apparent then, that all problems of electrical control in the case of mills, heavy machinery, and the like, have been satisfactorily met by the Ward Leonard Systems of Control.

*The application of this specific knowledge of electrical and mechanical control to the automobile industry has made it possible for the Ward Leonard Company to offer motorists and manufacturers a starting and lighting system that is efficient, simple, and reliable because it is based on scientifically correct principles of control.*

Time and test have proved our claims. Our system is the result of a quarter of a century of evolution and our experience is your guarantee.

WARD LEONARD ELECTRIC CO.  
BRONXVILLE, N. Y.

**WARD LEONARD**





## If selling tires is your *business* why not be the *representative* dealer in your community?

It is possible for every tire dealer in the country to occupy the same dominating position in his own field that the United States Tire Company occupies in the Nation.

He can be a *leader*.

Four-fifths of all the best dealers now handle United States Tires, and there are many decidedly logical reasons why these men, interested in the future of their business and in the welfare of their customers, should line up with this organization.

In the first place, no one seriously disputes the leadership of the United States Tire Company in the tire field. Its factory resources are epoch-making in the history

of the tire industry — four immense plants where tires are manufactured with the one fixed purpose of producing a uniform standard of quality.

*Tires made as United States Tires are made can safely be sold under any good dealer's personal recommendation.*

Added to these magnificent production facilities is a comprehensive sales organization which places the dealer always in close touch with the factory output.

And behind these manifestly advantageous resources is the United States Tire Company's policy of co-operating with the dealer instead of competing with him.

Do you know of any more certain way to dominate the tire field in your own particular community than by selling America's *Predominant* Tires, with the co-operation and backing of the world's leading tire concern?

---

# UNITED STATES TIRE COMPANY

## NEW YORK

# TIMKEN

## AXLES & BEARINGS



### Read Your Answer in the Cars

**D**O Timken principles of axle and bearing construction work out in practise? Are their merits acknowledged by the leading motor-car builders?

These questions are natural and just. You have read the Timken stories of axle and bearing importance in previous advertisements.

You have felt, as you read, that Timken principles were right, that they must have proved right on many a steep hill and stony road.

Nor did you err, for hundreds of thousands of Timken-equipped motor-cars, pleasure and commercial, are daily demonstrating the worth of Timken principles and Timken construction.

#### At the points of severest service—there you are most likely to find Timken Equipment

Because front axles and the bearings on their spindles *must* stand up to the tests of every day travel and meet the emergencies, builders of good cars dare not take chances at these vital points.

On the right are listed nearly all of the cars using Timken Tapered Roller Bearings and Timken-Detroit Axles. Among them, you will agree, are most of the best known and highest grade cars made in the country.

All of the makes of cars listed here use Timken Bearings or Axles on one or more models, throughout or in part.

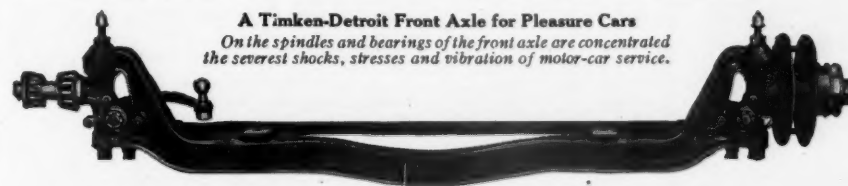
To be specific, 97¼% of all these cars have Timken Bearings at the points of severest service—on the spindles of the front axle.

In addition to that, 93¼% of the entire list have Timken Axles or Bearings at all or some of the following points: rear axle, rear wheel bearings, differential and pinion-shaft bearings, transmission bearings, commercial rear axle and jackshaft, and their hubs and bearings.

Also 61¼% of the pleasure cars and 72¼% of the commercial cars listed at the right have Timken-Detroit Axles, front or rear or both.

Coming back, then, to the questions: "Do Timken principles of axle and bearing construction work out in practise? Are their merits acknowledged by the leading car builders?"

You can read your answer in the cars.



**A Timken-Detroit Front Axle for Pleasure Cars**  
On the spindles and bearings of the front axle are concentrated the severest shocks, stresses and vibration of motor-car service.



**THE TIMKEN ROLLER BEARING CO.**  
Canton, Ohio

**THE TIMKEN-DETROIT AXLE CO.**  
Detroit, Mich.



Below are listed most of the cars using Timken Tapered Roller Bearings and Timken-Detroit Axles throughout or in part:

#### PLEASURE CARS

Abbott-Detroit — Amplex — Atlas-Knight — Bartholomew — Buffalo Electric — Cadillac — Case — Chalmers — Chicago Electric — Colby — Cole — Columbia — Columbus Electric — Crawford — Cunningham — Detroit-Electric — Diamond-T — Dorris — Edwards — Flanders — Franklin — Great Eagle (U. S. Carriage Co.) — Haynes — Kissel-Kar — Knox — Lexington — Locomobile — Lozier — Marion — Marmon — Mason — Mason-Seaman Taxicab — Matheson — Maxwell Special — Middleby — Mitchell — Moline — Moon — Moyer — National — Overland — Packard — Palmer-Singer — Peerless — Pierce-Arrow — Pope-Hartford — Premier — Pullman — Rauch & Lang — Reo — Reo (Canada) — Russell (Canada) — Shaw Taxicab — Simplex — Speedwell — Stafford — Stanley Steamer — Stearns-Knight — Stoddard-Dayton — Stutz — Thomas — Tudhope (Canada) — Velie — Walker — Waverly Electric — Westcott — Winton — and many others.

#### COMMERCIAL CARS

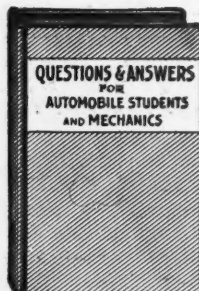
Ahrens Fox Fire Engine — Alco Truck — American-La France Fire Apparatus — Atlantic Electric — Atterbury — Autocar — Avery — Baker Electric — Bessemer — Bronx — Cass — Commercial Truck of America — Dayton Auto Truck — Detroit-Electric — Dorris — Federal — Four Wheel Drive — Garford — General Vehicle — Grabowsky — Gramm (Lima) — Gramm (Canada) — Gramm-Bernstein — Harrison — Hewitt (International Motor Co.) — Ice Mfg. Co. "A. I. C." — Kissel-Kar — Knickerbocker — Knox — Lansden Electric — Lewis — Lippard-Stewart — Locomobile — Lozier — Mack (International Motor Co.) — Mais — Marathon — Martin — Mather Funeral Car — Moeller — Mogul — Moore — Mooreland — Morgan — Oliver — Packard — Packers — Peerless — Pennsylvania R. R. — Pierce-Arrow — Pope-Hartford — Randolph — Rapid — Reliance — Reo — Rowe — Sampson — Schacht — Seagrave Fire Apparatus — Speedwell — Standard — Sternberg — Stewart — Stewart Iron Works — Studebaker — Toledo — Transit — U. S. Truck — Universal — Velie — Victor — Vulcan — Walker — Ward — Waterous Fire Apparatus — Waverly Electric — Webb Fire Apparatus — Wilcox — Woodworth — and many others.

When Writing to Advertisers, Please Mention Motor Age.



# ANY BOOK ON THIS PAGE SENT FOR \$1.50 PREPAID

## Questions and Answers



### For Automobile Students and Mechanics

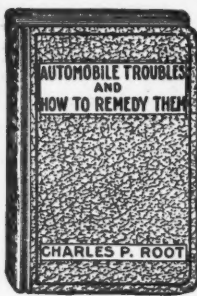
By THOMAS H. RUSSELL,  
A book of 600 Questions and Answers, adapted for teaching School, the Machineshop or before the Board of Examining Engineers. This is the largest, the latest and most authentic book of its kind upon the market. Prepared especially for Home Study. 150 pages. Bound in flexible covers—In fact it is a regular text book.

## Automobile Troubles and How To Remedy Them

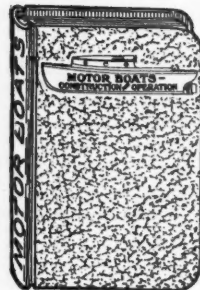
By CHARLES P. ROOT, Former Editor  
"Motor Age."

Pocket size—5 x 7 inches, 225 pages, illustrated, handsomely bound in red flexible leather, round corners, red edges. The only book of its kind published. It not only tells you how to locate troubles and make repairs, but shows you.

**CONTENTS**  
Back or too early firing (preignition)—Blow-back of gas into carburetor—Popping noises—Buzz in coil (other than contact breaker buzz)—Misfires—Smells—Stoppage of engine—Batteries—Bearings—Brakes—Carburetor—Change speed gear—Clutch—Coi—Connecting rod or crank shaft broken—Gear—Governor—Ignition—Lubrication—Misfires—Muffler troubles—Overheating—Piston troubles—Popping in carburetor—Spark plug—Steering—Timing—Tires—Valves—Valve springs, and numerous other troubles.



## Motor Boats: Construction and Operation



By THOMAS H. RUSSELL, A.M., M.E.  
Pocket size, 300 pages, fully illustrated, flexible leather, round corners, red edges. A manual for motor boat and yacht owners and all users of marine gasoline engines.

**CONTENTS**  
Principles of marine gasoline Engines—The two cycle and four cycle engine—The power boat in business, recreation and racing—Battery and magneto ignition—Use of wet batteries and dry cells—High tension and low tension current—The storage battery and dynamo—Actual working of marine gasoline engines—Carburetor and carburetors—Valves and connections—Latest improved types—Motor troubles, their causes—Lubrication and lubricators for marine engines—Offset cylinder construction—Reverse gears—Two and three bladed wheels—Motor boat hull construction, etc., etc.

## Gas Engine Troubles and Installation

By J. B. RATHBUN, B.S.C.E.  
Author of "Commercial Vehicles for All Purposes," "Oxygen—Acetylene Welding," etc.

440 Pages, 150 Detailed Line Drawings and Illustrations.

A book that shows you HOW TO INSTALL—HOW TO OPERATE—HOW TO MAKE IMMEDIATE REPAIRS and HOW TO KEEP A GASOLINE ENGINE RUNNING. The language is simple—The illustrations are clear. The book is authentic—complete—up-to-the-minute, written by an expert who is employed daily as a Consulting and Demonstrating Engineer and Instructor. Nothing has been omitted—it contains no useless matter—Just the cream of daily experience. Two Folding Trouble Charts.



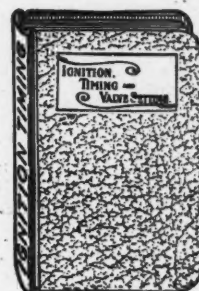
## Ignition, Timing and Valve Setting

By THOMAS H. RUSSELL, A.M., M.E.

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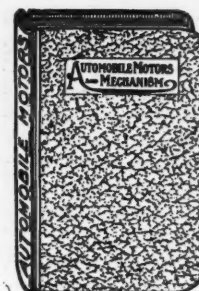
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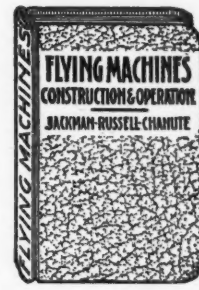
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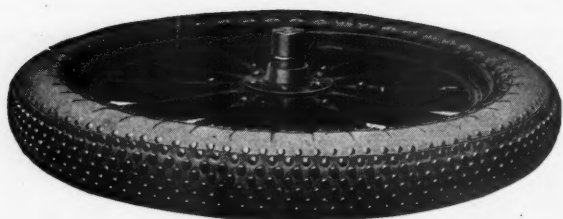
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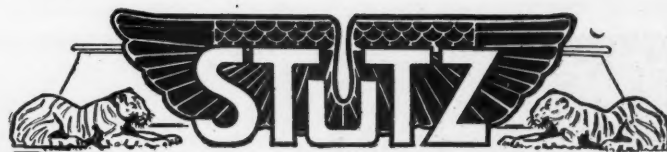
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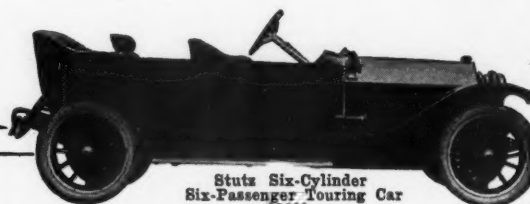
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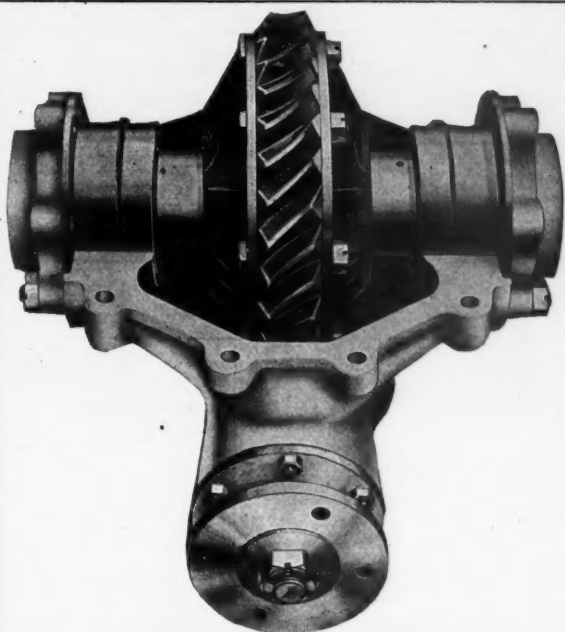
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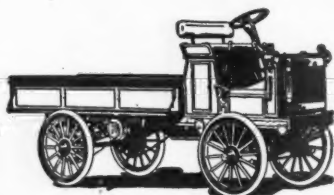
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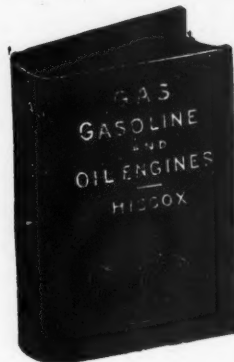


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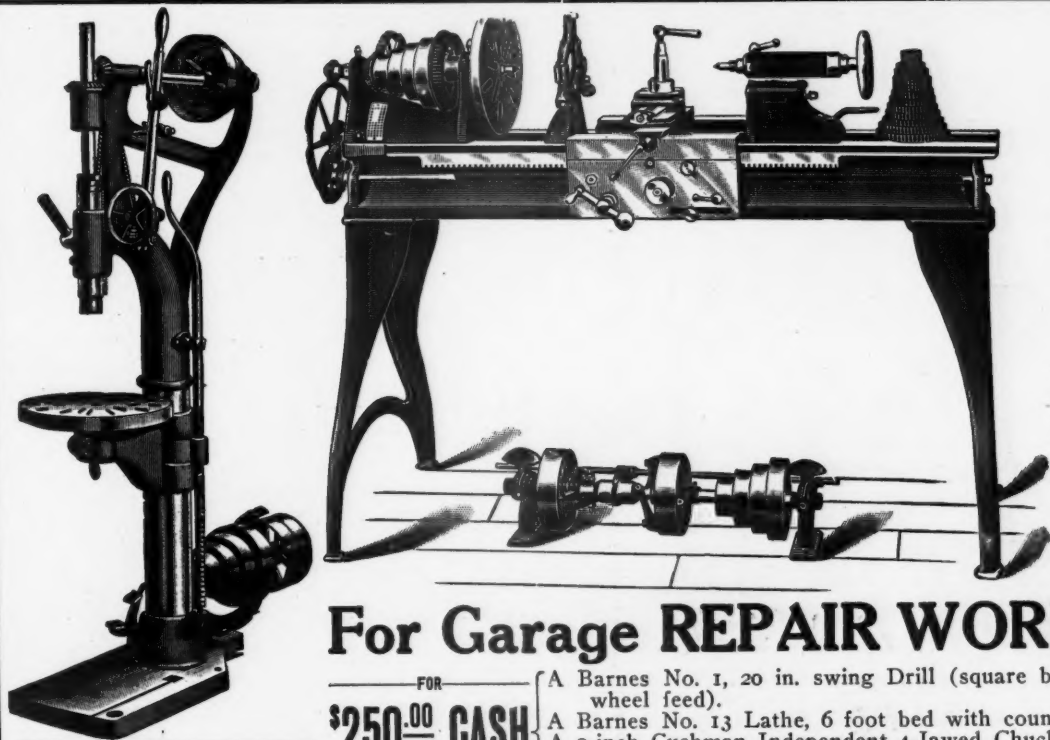
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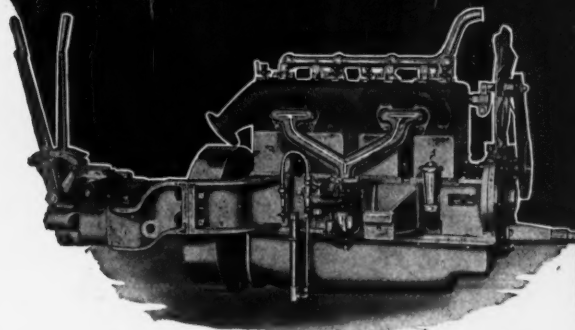
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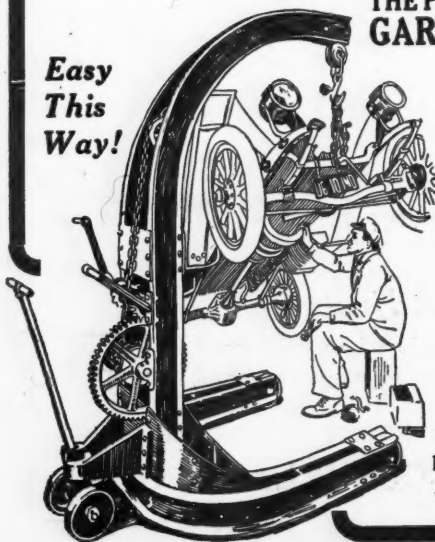
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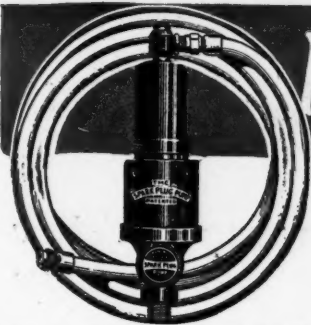


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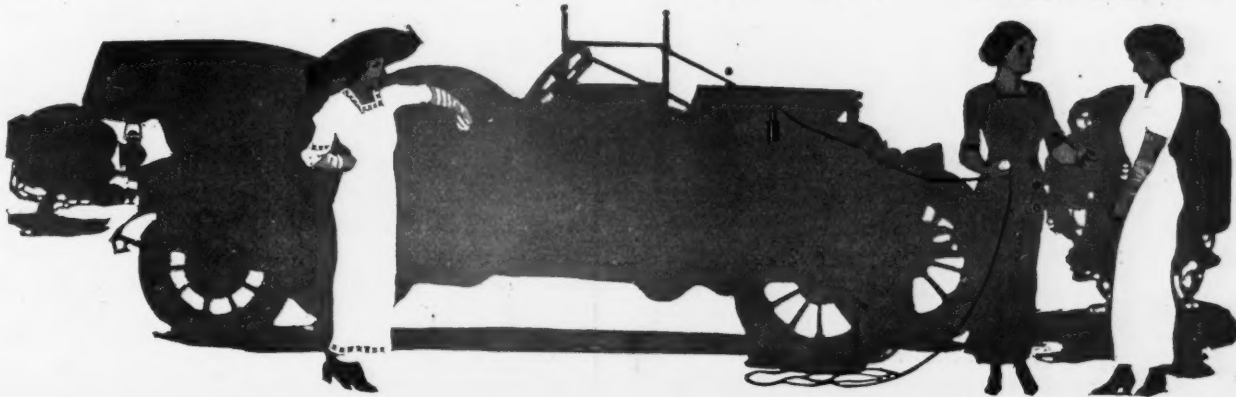
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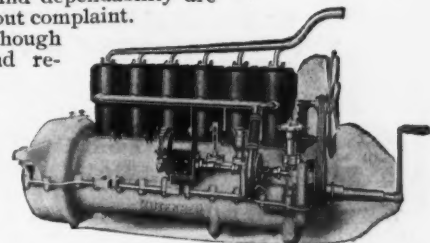
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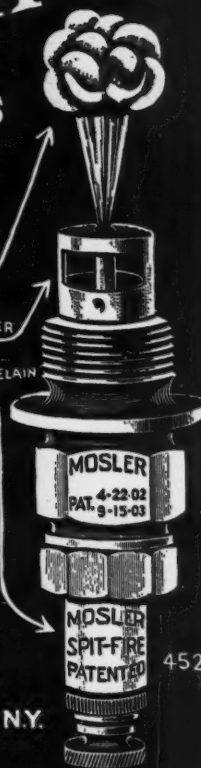
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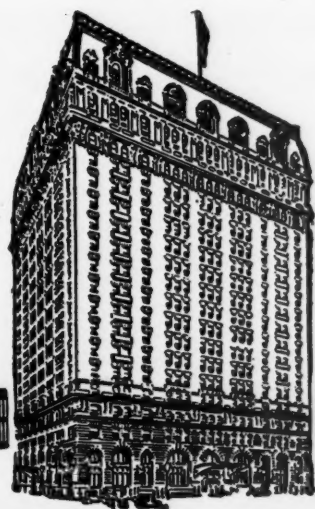
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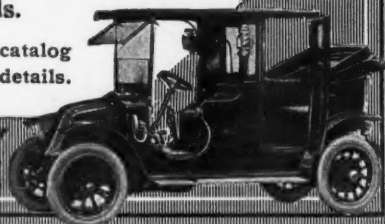
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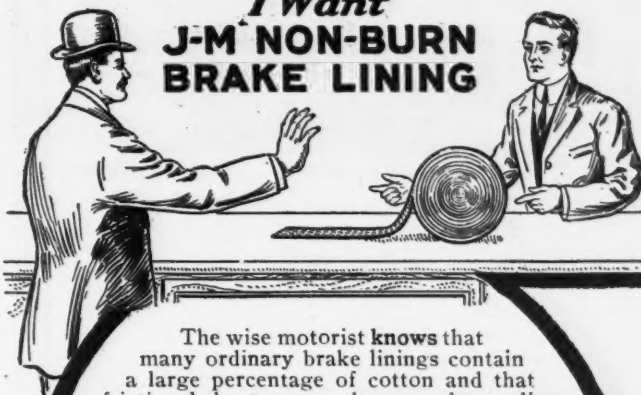
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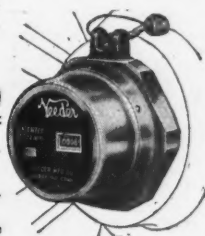
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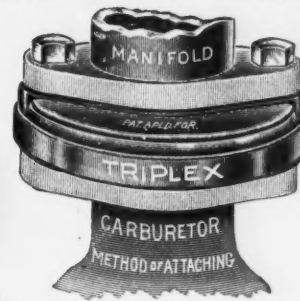
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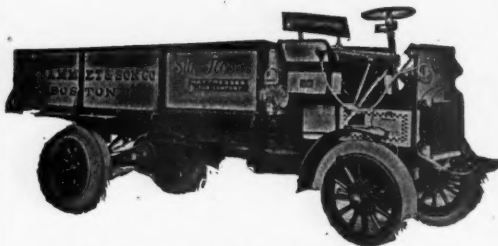
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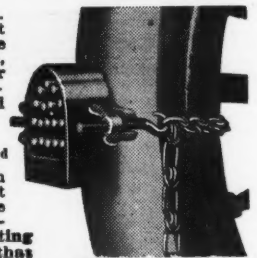
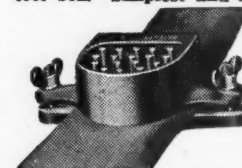
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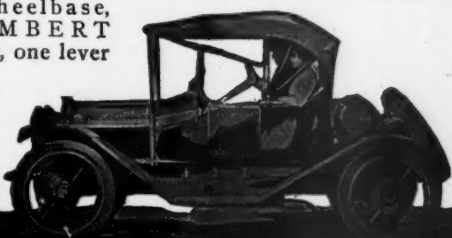
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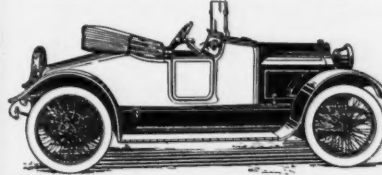


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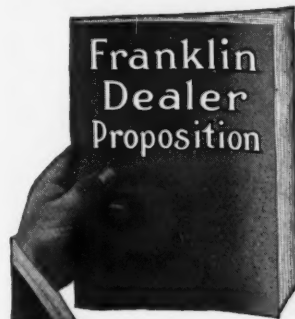
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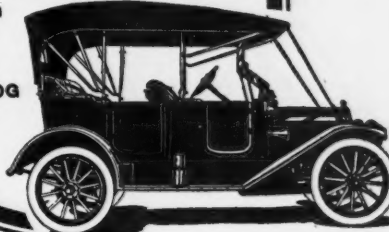
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38 Years' Manufacturing Experience  
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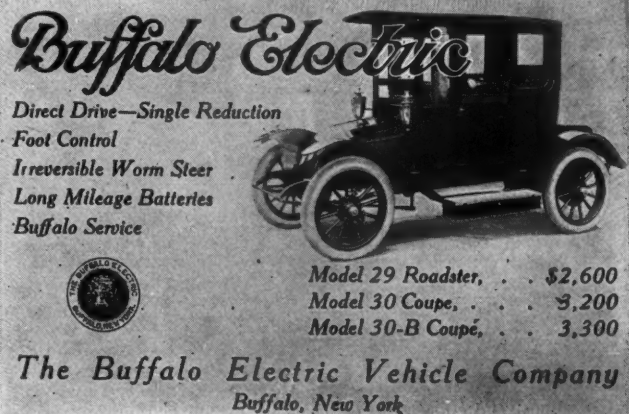
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THE CAR THAT CAPTURED FIFTH PLACE AT INDIANAPOLIS, MAY 30TH

Here is Model "N S" - Electric Starter, Electric head lights, side lights and tail lamp operated with generator and storage battery, 36 x 4 demountable rims with one extra rim, folding zig-zag wind shield, trip speedometer, aluminum adjustable ventilator in windshield base, robe rail, foot rail, tire irons, horn, pump, all tools, jack and tire repair outfit. Price \$1850. Send for dealers' proposition.

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Irreversible Worm Steer  
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No Valves  
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WILL REPLACE ANY ENGINE IN ANY CAR

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Sworn statements of individual owners, covering more than a million miles of travel, give the Winton Six the world's record for lowest repair expense—29.2 cents per 1000 miles. Our latest Upkeep Book gives all the facts. May we send you a copy?

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World's First Maker of Sixes Exclusively



Double Ended Ratchet Wrench Strapped to

SEVEN  
STRONG  
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SOCKETS  
STRUNG  
ON A  
SQUARE  
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A MARVELOUSLY  
PRACTICAL WRENCH  
FITS 'EM ALL

It's the Kind You Want

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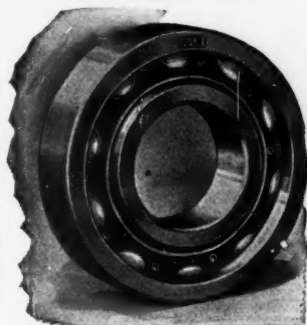
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Oldest and Leading European

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Long stroke motor, 8 1/2 x 5 1/4".  
Enclosed valves.  
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Unit power plant.  
Multiple disc clutch.  
Three speeds forward.  
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Quick detachable rims.  
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Chassis and specifications same as Touring Car. Large turtle back dust-proof compartment for extra accessories, tires and baggage.

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*Guide*



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has been adopted as standard 1913 equipment on some of the best cars.

The Semaphore lens gives wide distribution of light. The lamp is strong, the design is good.

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*Guide*

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**Four and Six Cylinder Models**  
**\$1000 to \$3000**

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\$1500  
4 cylinders  
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\$1975  
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\$2650  
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**JACKSON**  
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fit any style or make of tires. The side rings are reversible, they curve outward on one side to fit a straight side tire, inward on the other to accommodate a clincher. Two turns of a nut unlocks the rim for demounting, two more turns locks the rim in place.



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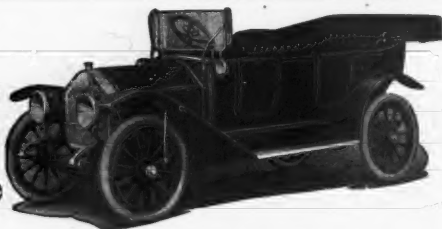
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**AXLES WHEELS  
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JAMESTOWN, N.Y.

Model "P"  
Five  
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Four-Cycle  
Four  
Cylinders  
4 1/2 x 5 1/4  
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40 H. P.  
Long  
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Price  
\$1750.00  
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Cast in  
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**ENGHER**  
"THE CAR OF VALUE"

Positive electric starter, electric lights all around and electric horn. Unit power plant, enclosed valves, three point suspension. Wheel base 120 inches, full floating rear axle, 1/4 elliptic rear springs, demountable rims with 8x4 tires, straight line bodies. Made in three models. Speedometer with grade indicator and eight-day clock with electric light—"Everything you need in a car."

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Electric  
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Bodies slightly higher

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Branches—Coast to Coast

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For Private  
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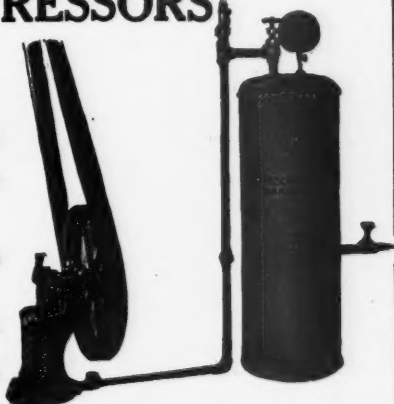
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Single and Double Cylinder

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Three Great Models: Pilot 40—Four cylinders, 4½x5; brake test, 58 horse-power; 120" wheel base; price, \$2000. Pilot 50—Four cylinders, 4½x6; brake test, 59 horse-power; 126" wheel base; price, \$2250. Pilot 60—Six cylinders, 4x8; brake test, 67 horse-power; 182" wheel base; price, \$2500.

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Stock, or  
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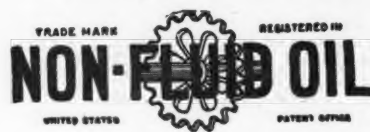
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It has just the right consistency.

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They are long lived, water-proof, heat resisting, simple in construction and of low battery consumption. They give a spark that's a flame. Magnetos, Coils, Plugs, Timers, Switches and other Ignition Goods.

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- Large Bearings
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- Perfect Workmanship
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**ALL 4 CYCLE—5 TYPES**

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### Easy of Operation

Easiest rim to mount and demount. Easiest rim on which to mount or demount tire.

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You will enjoy the exhibition of the

### Dreadnought Moline M-40 \$1950

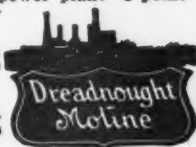
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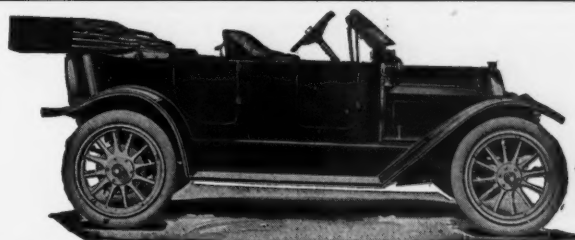


# Studebaker

"25"—5 Passenger.....\$ 885  
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No moderately priced automobiles ever possessed so many refinements of the highest priced cars as do the new Studebaker models. They are—without exception—the biggest values ever offered. Studebaker cars make the work of Studebaker dealers easy.

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America's most comprehensive line. Every car completely equipped. 3 sizes chassis—10 body styles. Price range from \$875 to \$1800

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are as necessary to Car Users as a pocket knife is to you—as useful as a hair pin to a woman. There are 800,000 Car Owners in the United States who KNOW that it pays to repair small cuts in Tires. ARE YOU ONE OF THEM? Hadn't you best write for free copy of "Tire Insurance," or better, send a dollar for a pair of nickel plated PLIERS and combination cleaner and cotter pin hook? They will pay for themselves the first seventy-five miles. They will pay for a set of Tires every 4,000 miles. We guarantee satisfaction.



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Pliers opened, distending cut for cleaning, tool applying gum. Ratchet in handle holds Pliers open. (Pat.)

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SECTIONAL VIEW

"Make Every Car a Parlor Car"

Send for Catalog No. 28

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WARNS WITHOUT OFFENCE - ALWAYS EFFECTIVE  
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JUBILEE  
(CHIME TONE)

# Jubilee CHIME TONE Horn



IT'LL TAKE A DERRICK TO  
STEAL THE CAR LOCKED  
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Long stroke, powerful Continental Motor—Electric (Dynamo) Lights—Self Starter—Left Hand Drive—Full Equipment—"Amesbilt" Bodies and Tops. A combination of power, speed, endurance and graceful lines. Price, fully equipped, \$1,635. This is 1913's most remarkable car value. Backed by a reputation of 30 years, it will win you from the first inspection. We have a most liberal proposition for good, live agents. Send for catalog today.

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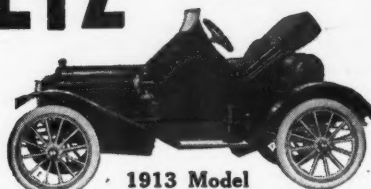


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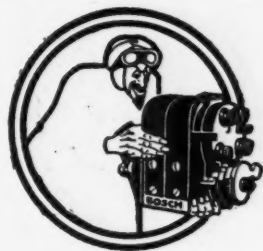
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The vulcanizing  
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HEAVY CLAMPS  
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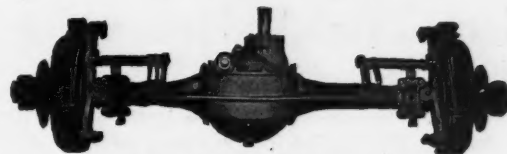
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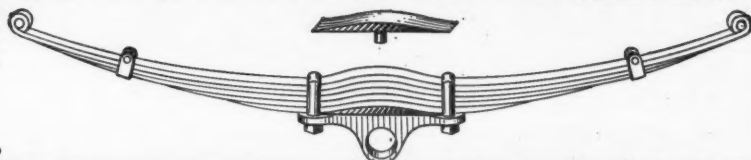
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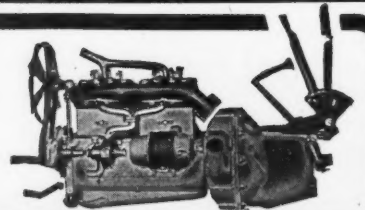
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Pacific Motor Car Exch. Co., 229 W. 54th St., N. Y. M. Rozenwelz, Gen. Mgr.

**CADILLAC LIMOUSINE, WITH EXTRA** touring body, top, glass front and fenders, overhauled, guaranteed like new, 1911 model. Iowa Auto & Tire Co. (Cadillac Agents), Davenport, Iowa.

**COUPE FOR SALE—1912 OVERLAND** coupe with extra roadster body; ideal for physician; full equipment; condition perfect. Box 44, New Brunswick, N. J. w

**FAL CARS AND REPAIRS**  
F. A. L. Auto Co., 4052 Princeton Ave., Chicago. Phone Drovers 1712.

**FOR SALE—A PRACTICALLY NEW FOUR-** passenger, fore-door touring car equipped with imported Daimler Knight six-cylinder motor. This car is nicely finished in black, with Speedwell gray body and wheels. It was an experimental model built to sell for \$4,000. Has been run a few hundred miles and overhauled. Will sell for \$2,500 cash. Further particulars apply Speedwell Motor Car Company, Manufacturers, Dayton, Ohio.

**FOR SALE—BRUSH RUNABOUT, FIRST-** class running condition; painted red last season; new tires, windshield, new top, detachable rear seats, Presto lights, horn. Cheap if sold at once.

Henry M. Williams, Machine Shop, Vincennes, Ind.

**FOR SALE—CHEAP, ONE AMERICAN** Traveler, color battleship gray; just like new; run a little over 5,000 miles. Michigan Auto Co., 410 7th St., Calumet, Mich.

**FOR SALE—DELIVERY CARS: ONE IN-** ternational with top, one Cadillac single-cylinder, overhauled, repainted. Neiman Machine Works, Freeport, Ill.

**FOR SALE—ONE FLANDERS "20," 5 PAS-** senger car in A No. 1 condition at a bargain. Address H. M. Real, 12041 Butler St., Chicago, Ill.

**FOR SALE—ONE NEW 1912 58 H. P. FOUR-** cylinder, full fore-door limousine. Car is beautifully upholstered in broadcloth and is equipped with electric lights, demountable rims, one extra rim and full tool equipment. Will sell below cost if sold at once. STODDARD DAYTON SALES COMPANY, Dayton, Ohio.

**FOR SALE—ONE 1911 OVERLAND FOUR-** passenger touring car, \$350; fine shape; top, windshield, gas tank, speedometer, 33x4-inch tires; good as new. H. Kaskel, Spencer-ville, O.

**FOR SALE—ONE 1912 48 H. P. SAYBROOK** Compartment Roadster in A No. 1 condition; run less than 3,000 miles. Car is fully equipped with windshield, speedometer, top, top boot, demountable rims, one extra rim, electric lighting system, self-starter, Hartford shock absorbers, tire holders and nickel trimmings. Will sell cheap if sold at once. STODDARD DAYTON SALES COMPANY, Dayton, Ohio.

**FOR SALE—STANLEY STEAMER, IN EX-** cellent condition; cheap. W. J. Morgan, Box 284, Seaton, Ill.

### FOR SALE

Twenty Motor Trucks,

both electric and gasoline; these trucks are of varied makes; have been used and are still in use by us in Indianapolis in transportation of our freight, but owing to the completion of our large new plant, located direct on private switch tracks, the necessity for hauling our freight is removed, and we are therefore willing to sell very cheaply our entire lot of trucks. These trucks are all from 2-tons capacity up and are in good, serviceable condition. Any person desiring trucks of this class would do well to address

General Traffic Manager,

The Prest-O-Lite Co.,

Indianapolis, Ind.

**FOR SALE—PACKARD, 4-CYLINDER, 1909,** 18 car, fully equipped with windshields, shock absorbers and pump for inflating tires; car in excellent condition. Address E. O. TOWNSEND, Mansfield, Ohio.

**FOR SALE—WHITE STEAM CARS, VARI-** ous models, in excellent condition; also parts for steamer engines and generators. We specialize in steamers. Joseph Libal, 3145-53 N. Halsted St., Chicago.

**FOR SALE—1911 MODEL STODDARD-** Dayton automobile, 7-passenger, 50 h. p., equipped with all auxiliaries. In perfect condition. Address Box D 220, c/o Motor Age.

**FOR SALE—20 PASSENGER SIGHTSEE-** ing car; good condition; cheap for cash. Box D 140, c/o Motor Age. m

### FRANKLIN

1910 Model D, 5-passenger, fully equipped, refinished, \$750. Franklin Motor Car Co., 733 Boylston St., Boston, Mass.

### GOING TO BUY A USED CAR?

Let us send you the names of individual owners. Free weekly report gives complete descriptions, prices, etc. Save money by dealing direct. Write now. Auto Reports Bureau, 310 Shops Bldg., 19 N. Wabash Ave., Chicago.

**LATE MODEL PAIGE-DETROIT ROAD-** ster fully equipped in good mechanical condition. Will sell at a very low price. The White Co., 2635 Wabash Ave., Calumet 5311, Chicago.

**MAXWELL RUNABOUT, BOWSER GASO-** line outfit, vulcanizing plant, will sell cheap or trade. Geo. B. Johnson, Lebanon, Ohio.

**MITCHELLS REBUILT, GUARANTEED.** These cars are fully equipped. Call or write for further particulars. Mitchell Automobile Co., 2334-36-38 Michigan Ave., Chicago.

**MODEL T FORD TOURING CAR, 1911.** First check, \$375, takes it. Good condition. Box 393, Lincoln, Kas. c

### PREMIER

Rebuilt cars like new. Must sell quickly to make room for new Models.

1911 Stearns.	1910 Winton.
1911 Chalmers.	1909 Peerless.

Will make special price to move these cars. The Quality Car Co., 2329 Michigan Ave., Chicago. Cal. 4501.

**PACKARD DEMI-LIMOUSINE; BEST OF** condition. Krit coupe, just overhauled and painted, for sale cheap. Ajax Auto Co., 834 E. 43d St., Chicago.

**SPEED RATE OF 100 MILES AN HOUR** guaranteed—Stanley racer—low price. Excellent condition. O. P. Tyler, 31 Central St., Worcester, Mass. m

**WE HAVE REAL BARGAINS IN USED** cars: One E. M. F. run less than 7,000 miles; all new tires and complete in every way, \$600; 1 Buick roadster, complete, \$375; 3 1911 Fords, complete, \$375; 1 5-passenger Reo, \$250; 1 Westcott, \$100; 1 McIntyre, \$100. The above cars have recently been overhauled and are in good shape. Mankato Automobile Co., Mankato, Minn.

**WINTER SICK CARBURETERS AND MISS-** ing motors cured by hot-air pipe to carbureter. Absolutely vaporizes gasoline. Pick-up, power, economy gained. You install our complete outfit ten minutes. Outlasts car. Effective and cheap. Write us now for details. Breeze Carbureters, Newark, N. J.

1905 PACKARD 4-PASSENGER, GOOD shape, \$300; 1907 Thomas 7-passenger, double chain, \$200; 1-cylinder Cadillac or Olds, each, \$50; 1907 Thomas and model R Stevens, parts cheap, front and rear axles with wheels, \$10. Fred Peulecke, 9237 Houston Ave., South Chicago, Ill.

1912 MERCER, 4 PASSENGER, NEW AND perfect, used but few miles, cost \$2,900. Must raise money, so will sacrifice. S. Z. Silversparre, 1717 E. 7th Ave., Denver. b

1912 VELIE RACYTYPE ROADSTER, fully equipped with Vesta dynamo electric lighting system for all lamps, self starter, 100-mile Warner speedometer, six demountable rims, pressure gauge on gasoline tank. Car in excellent condition. Three new tires, 8,000 miles. CHESTER A. DODGE, Slater Bldg., Worcester, Mass.

1912 WOODS ELECTRIC DEMONSTRATOR in first-class condition; driven 1,500 miles. Will sell cheap. Yeggy-Don Sales Co., Rock Island, Ill.

1913 PACKARD—WILL DISPOSE OF MY new 1913 6-cylinder, 7-passenger touring car at a bargain, if taken immediately. Address H. M. Wallis, Jr., Racine, Wis.

## Cars Wanted

### AUTOMOBILE WANTED

In exchange for good land, or for residence lots in Hugo, the best town in eastern Colorado; let me know what you have; 5-passenger machine, in good order only, wanted. F. E. Ewing, Hugo, Colo.

WANTED—1912 AUTO IN EXCHANGE for 160 acres good Minnesota land. Address Box 414, Marshalltown, Ia. k

## Parts and Accessories FOR SALE

A BATTERY BARGAIN—6-80 STORAGE batteries, Exide, Vesta, National, Universal, for auto igniting and lighting, \$1.50 to \$7.50. 4105 Cottage Grove Ave., Chicago. a

ALL NIGHT MACHINE AND GARAGE CO. Shop operated every hour of every day. No extra charge for night work. Make any part for any car. We hurry up. 7031 So. Chicago Ave., near Cottage Grove Ave., Chicago. Dan Morgan Smith (owner). Phone Normal 3266.

### ATTENTION—HENRY OWNERS

Having purchased the repair business of the Henry Motor Co., we are prepared to fill orders promptly for repairs for Henry cars. Muskegon Automobile Co. Muskegon, Mich.

### AUTOMOBILE BODIES, PLEASURE AND Commercial.

Foredoors for open-front cars. Write for prices. Auto Specialty Mfg. Co., 326 E. Market St., Indianapolis, Ind.

A WET CLOTH AND A PACKAGE OF Ar-Gen-Tor is all that you need to plate all the brass trimmings on your car with a heavy, permanent plate of pure silver. Your car will always look new, and you will not have to polish brass any more. Does not contain mercury or poisonous cyanide. Send \$1 today for large size box. Forest City Sales Co. Fremont, Neb.

### BALL & ROLLER BEARINGS, ALL TYPES.

Distributors of  
"F & S" Ball Bearings.  
"New Departure" Ball Bearings.  
"Pressed Steel" Ball Bearings.  
"Standard" Ball and Roller Bearings.  
BALL BEARINGS REPAIRED.  
THE GWILLIAM COMPANY.  
New York—Broadway, at 58th St.  
Philadelphia—1314 Arch St.

BODIES, FOREDOOR, TOURING RUN-about, \$15.00 to \$50.00. Fenders painted dark blue, \$10.00 set of 4; Selective type 4-speed shifting levers complete with emergency brake lever, \$8.00. Other bargains. Automobile Appliance Co., 1712 Michigan Ave., Chicago, Ill.

BRAND NEW 35-40 H. P. FOUR CYLINDER motors, with fan, pump, clutch, magneto and coil. Price \$222.50. Not old, discontinued models, but up-to-date in every way. F. E. Alford, Goshen, Ind.

### BUICK OWNERS

Why pay two prices for a radiator? We guarantee them when we sell them at

Buick "10," "32" and "33".....\$26.50  
Buick "16" and "17".....32.50  
Buick "19".....27.50

Write for other makes.

### AUTO PARTS MFG. CO.

Detroit, Mich.

### CUT-OUTS

E.M.F., Flanders, Buick, Regal, etc. Complete outfit with brass lock, open pedal, \$1.50. Lincoln Machine Shop, Lincoln, Ill. c

### DETROIT FORE-DOORS

for

E-M-F, Ford and Hudson.  
One piece aluminum; immediate shipment subject to inspection.  
Detroit Fore-Door Co.,

564 Porter St.,

Detroit, Mich.

### DISCO SELF-STARTERS

For Sale. Only a few. Equip your car with a self-starter for this winter. Guaranteed new stock. List price, \$50; our price, \$12.50. Parsons Sales Co., 1817 Grand, Kansas City.

"DON'T ENVY A SMOOTH RUNNING MOTOR, use Hagstrom Spark Plugs and have one." Write for gas tank key and price list to The Hagstrom Bros. Mfg. Co., Inc., Lindsborg, Kan.

### DON'T GET COLD FEET!

Use Our Heater.  
For full particulars write to  
Garrison Gasoline Engine Specialties Co.,  
251 Richmond Street,  
Desk 1, Philadelphia, Pa.

### DRAGON REPAIR PARTS.

We manufacture and keep on hand all repair parts for the Dragon cars. We make a specialty of repairing this machine. Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.

ELECTRIC CHARGING BOARD (RECTIFIER); cost \$225; never been used; sell complete for \$75. Columbia Auto Exchange, Atlanta, Ga.

### ELECTRIC LIGHTING EQUIPMENT.

We can furnish a complete system for \$36. This outfit consists of one 6-volt, 140-ampere battery, two head lights, two side lights, one tail light, wire for car switch and bulbs. Head lights are 10-inch solid brass with silver plated parabola reflectors, and side lights are 5-inch same material. The Ampvo Battery Co., 1607 Michigan Ave., Chicago, Ill.

### E. M. F. PUSH ROD ADJUSTERS

\$1.50 for complete set delivered. Money back guarantee. Auto Parts Co., Providence, R. I.

FORD AGENTS—WE MAKE A SPECIALTY of Dust Hoods to cover top when clashed down, for Model T Ford 1910-1911-1912-1913 cars. Write for prices. Will save you money. The H. A. Hawes Storm Front Co., Coldwater, Mich.

### FORD, HUPP AND MAXWELL

Muffler cut-out machined ready to attach, including lock, open pedal string and cables, \$1.35. Lincoln Machine Shop, Lincoln, Ill. c

FORD FAN BELTS—WOVEN COTTON and silk; outlasts six regular belts. Postpaid, 75c. Dealers write. Angler's, Streator, Ill.

### FORD OWNERS

A postal brings you our 1912 catalog of 22 necessities for your car. Auto Parts Co., Providence, R. I.

### FORD OWNERS AND DEALERS!

You will save trouble and money by installing our timer elevating device.  
Ford Parts Specialty Co.,  
1211 Main St., Richmond, Ind.

FORD OWNERS—TOWNSAN VALVE ADJUSTERS will quiet your motor. \$1.50 by mail. Townsan Auto Specialties Co., Mitchell, S. D.

### FORD T OWNERS

Foot throttle or accelerators, \$1.50. Lincoln Machine Shop, Lincoln, Ill.

### FORD OWNERS

New guaranteed Ford T radiators \$18, model N-R-&-S. Complete with pump, \$23. Write for other makes.

### AUTO PARTS MFG. CO.

Detroit, Mich.

### FORE DOORS

Made for all makes of cars. Prompt shipment guaranteed. F. E. Lortz Co., 2503 E. 55th St., Cleveland, O.

### FORE DOORS

WE HAVE patterns for all cars made in doubled material of pantasote leather; are easily attached; price \$4. BOSTON AUTO TOP CO., 98 Mass. Av., Boston, Mass.

FOR SALE—A BOWSER GASOLINE OUTFIT complete with 170-gallon underground tank, in first-class condition. Reason for selling, too small for our needs. Price, \$100. Star Auto Co., Pella, Iowa.

FOR SALE—AUTO BODIES, FORE-DOOR, new, \$60.00 to \$95.00. Motors, Axles, Auto parts and accessories. Closing out factory stock.

Independence Motors Co.,  
Detroit, Mich.

FOR SALE—CHEAP, TURNING LATHE, double head grinder, portable forge, gasoline engine, shafting, pulleys, belting, vises, vulcanizer and other garage tools. J. L. Hetzner, Peru, Ind.

FOR SALE—COUPES FOR IMMEDIATE delivery. Stylish, up-to-date and well constructed. Fit almost any car. Write us. Robbins & Co., Indianapolis, Ind.

FOR SALE—NEW UNIVERSAL DEMOUNTABLE rims, 5 to a set complete, \$10; 32x3½; 34x3½; 34x4; 34x4½. Triple Action Spring Co., 215 E. 21st St., Chicago.

FOR SALE—ONE LIMOUSINE BODY FOR Stearns 30-60 chassis. Body cost \$1,750 when new; used one season and in perfect condition. Price, \$800 f. o. b. Louisville. Louisville Lozier Company  
Louisville, Ky.

FOR SALE—ONE SPLITDORF MAGNETO, \$10; one Michigan magneto and coil, \$15. H. A. Merten, 1819 Capitol Ave., Des Moines, Iowa.

FOR SALE—ONE 1910 5-PASSENGER, body and top, upholstering, in A-1 condition, for 1910 Cadillac chassis. Cadillac Automobile Co., Peoria, Ill.

FOR SALE—2 PENDERSON 6 SIGHT-feed oil distributors; 1 Lunkenheimer 6 sight-feed oil distributor; 2 single sight feeds for dash; 2 Lunkenheimer Paragon sight-feed oil drip cups, capacity 1 pint. W. H. L., 34 Sumner St., Dorchester, Mass.

FRAMES, 34-INCH WIDE—112 W. B.  
straight, each .....\$10.00  
Frames, 36-inch wide—112 W. B.  
straight, each .....12.00  
Frames, 36-inch wide—124 W. B.  
straight, each .....14.00  
Unassembled frames—Kickup 112-inch  
W. B., 34-inch wide, each..... 8.00  
For assembling each ..... 4.00  
Wheels—34x3½, 32x3½, 36x4½, per set. 12.00  
Axles—40-50 H. P., rear, each.....\$45.00 50.00  
30-40-50 H. P., front, each..... 12.00  
Radiators, 30 H. P., honeycomb, each..... 14.00  
Address Box D 169, c/o Motor Age. j



## JANUARY BARGAINS.

New mohair tops with curtains for Model 10 Buick, N, S and R Ford, Flanders 20, Herreshof and Krit Cars, each	\$ 13.00
Vanguard clear vision 42-inch shields, each	12.00
36 H. P. Unit Power Plant, disk clutch, selective transmission, enclosed valves	175.00
5x5 Columbia 4 cyl. motor, timer, pump, carburetor, fan, and cone clutch	100.00
30 H. P. Selective transmission with levers	43.00
Krit Radiators (Special Price)	15.00
Velle Radiator, 26x26, Honeycomb	25.00
Little Motor Co. Radiator, 26x25 1/2	20.00
Noyes Radiator, 22x22	18.00
34x3 1/2—36x3 1/2 Wheels, Q. D. rims, per set of four	12.00

Get our List No. 650.

AUTO PARTS CO.,  
513-15-17-19-21-23-25-27-29-31 W. Jackson  
Blvd.,  
CHICAGO, ILL.

## JANUARY SALE.

32x3 tires	\$ 5.00
32x3 1/2 tires	12.50
Tops, silk mohair	10.00
All size wheels	2.00
Windshield	7.00
Speedometer	7.00
1-inch carburetor, Puritan	1.00
Ford radiator, "N-S-R"	18.00
Ford radiator, "N-S-R"	23.00
Buick radiator, 10	26.00
Bosch magneto, Du 4	24.00
Gasoline tank	3.75
Foot rails	.75
Oil lamps, each	1.00
Tail lamps, each	.75
Head lights, pair	5.00

PURITAN MACHINE COMPANY,  
51 Tenth St.,  
Detroit, Mich.

**KEROSENE FOR AUTOMOBILES. NEW**  
Model B uses successfully half and half mixture lowest grades kerosene and gasoline. Satisfaction guaranteed or money refunded. Greatly increased power, very slow speed on high. Starts easy at zero. Special agents' prices. Department B. The Air Friction Carburetor Co., Dayton, Ohio.

## MAXWELL PUSH ROD ADJUSTERS

\$1.50 for complete set delivered. Money back guarantee. Auto Parts Co., Providence, R. I.

## MAXWELL SELF-STARTERS

Prest-O-Lite Tank Starter.

Don't break your back cranking that car when you can get a self-starter made for your car for \$10.

AUTO PARTS MFG. CO.

Detroit, Mich.

**MODEL C WINTON, 4-CYLINDER ENGINE**  
transmission and rear axle, all complete and in good shape, \$100. A. R. Joy, Smith Center, Kan.

**METAL BODIES, SEATS, FORE DOORS,**  
radiators, hoods, tanks and fenders. If building a car we can give you the right price. Auto Sheet Metal Works, 2228 Michigan Ave., Chicago.

## MORA REPAIR PARTS

We purchased the repair business of the Mora Company, and have in stock repair parts for all models of Mora cars. Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.

**NEW COUPE BODIES FITTED TO CAR,**  
\$250. Send for photo.  
Fred Allen Auto Supply Co.,  
1610 Michigan Ave., Chicago, Ill.

**NEW SEVEN-PASSENGER LIMOUSINE**  
body, with rear springs and mud guards for model Y Stevens-Duryea. C. C. Stoltz, Marion, Ohio.

**NICKEL PLATE YOUR AUTO TRIMMINGS**  
with Electro-Knickel. Prevents brass from tarnishing, iron from rusting. This is not a silver or mercury wash. We guarantee it plates (without a battery). Price \$1.00, express prepaid. Write for information. Gun Metal Finish Co., 313 Powers Block, Decatur, Ill.

**NEW UNIVERSAL DEMOUNTABLE RIMS,**  
5 to a set complete, at \$6.00; in sizes of 34x4, 36x4, and 36x4 1/2. Write for our rim part circular. Kastner Tire & Rim Co., 2112 Michigan Ave., Chicago, Ill.

**OXY-ACETYLENE WELDING PLANTS**  
The Admiral Welding Machine is the ideal welding device; large capacity; self-generating throughout; portable; complete in every detail; a perfect machine for all work, large or small. Send for our booklet, "Welding," and full description. Price, \$200 f. o. b. Kansas City. Admiral Mfg. Co., 715 Lydia Ave., Kansas City, Mo.

**PARKINS CARBURETOR, ELECTRIC**  
Horn, Complete Lighting System for Car, Dynamo, Battery, Lamps, Switches, Sockets. Low Prices for Quick Sale. Young, Nyack Ave., I nsdowne, Pa.

## PEERLESS AUTO TOP DRESSING

For Mohair and Duck Automobile Tops and Curtains.

**PEERLESS LEATHER TOP DRESSING**  
For Leather and Pantasote Tops and Curtains.

**PEERLESS LINING DYE**  
For Dyeing Linings of all Tops and Curtains Black.

**PEERLESS BACK AND CUSHION DRESSING**  
For Brightening Leather Backs and Cushions.

**PEERLESS EXTRA FINE BLACK JAPAN**  
For Enameling Lamps, Radiators and Fenders—Air Drying.

**PEERLESS EXTRA FINE BLACK BAKING JAPAN**  
For Enameling Lamps, Radiators and Fenders.

Manufactured only by  
**THE COLUMBUS VARNISH CO.,**  
Columbus, Ohio.

**PENNANTS FOR AUTOMOBILES MADE**  
in rights and lefts from any colored felts desired; size 12x30. Price \$1.00 per pair. Cash with order. Liberal discount to dealers. J. C. Orcutt & Co., Inc., Lincoln, Neb.

**PLATE THE BRASS ON YOUR CAR WITH**  
silver. Our preparation deposits pure silver over the surface of brass. With little expense you can keep the brass on your car a bright silver color. Simple to use, applied with a cloth. We also have the best nickel polish on the market. Does not wear the nickel off, but adds to its luster and durability. \$1.00 per bottle. Enough to plate the brass on your car for one year. Agents wanted. Write today.  
Re-Plating Co.,  
Box 474, Rochester, N. Y.

**REPAINT YOUR CAR YOURSELF—WITH**  
our materials and full instructions, you can repaint your car as well as a regular painter and save from \$25 to \$50, depending on its size. Previous experience unnecessary. Latest colors. Write today for full information and color cards. We also make Liquid Gun Metal, the National Brass Enamel, \$1 a can, express prepaid. The only articles of proven merit for lamps, radiators, etc. No polishing. Arsenal Varnish Co., Automobile Dept., Rock Island, Ill.

**REPAIR CURTAIN WINDOWS**  
with transparent flexible Pyralin. Sheet 18x20, 50 cents; 20x36, 90 cents postpaid. Truscott Supply Co., St. Joseph, Mich.

**REPAIR PARTS FOR ANY MAKE CAR AT**  
less than factory prices. Chicago's original gas engine men. Alexander & Cox Co., Ogden and Western Aves., Chicago.

## QUICK SALE

Liquidation & Realization Corporation.  
One lot new Victor Presto Self-Starters.  
One lot Leader Vulcanizers.

**Leader Vulcanizer**—We have been fortunate enough to secure for quick realization a large lot of Leader Steam Vulcanizers. Double your tire mileage. Leader Steam Vulcanizer will do it. It is the factory process put into a portable size. You do not have to remove the tire from the rim—can be operated on the road if necessary. Can be carried in your tool box.

This device will reduce your tire expense two-thirds, and you escape the delay of sending tires to the repair shop. Anybody can operate. Original selling price \$15.00 net. Our price for quick sale \$7.50, as long as they last.

**Victor Presto Self-Starter**—This starter attaches to your Prest-O-Lite tank, and it can be attached by any garage man at an expense of not over three hours at the outside. These starters adopted by 1913 Maxwell and other cars. Were made up for U. S. Motor's car and not delivered owing to receivership. Former list \$35.00—Sale Price \$5.00.

Must be sold—shipments by express, C.O.D. or send draft with order. Above prices good only while the lots last. Money refunded if not satisfactory.

GEO. H. BOWLER, Agent,  
511 Hippodrome Bldg., Cleveland, Ohio.

**SAVE WORRY—A PITLESS AUTO TURN-**  
table solves the problem. Catalogues on request. H. I. Forney, 1923 B, Lincoln, Neb.

**SEAT COVERS FOR ALL CARS—SPECIAL**  
price on Fords. We clean old covers; make them look like new. Auto Cape Top Co., 2334 Michigan Ave., Chicago.

## STARTERS

Automatic spring type. Guaranteed \$100 to \$125. J. W. Tudor, 35 Congress St., Boston, Mass.

## THE MULTITUDES ARE TESTIFYING

to the wonderful qualities of

## AR-GEN-TOR

the plating compound that actually plates your trimmings, copper, steel, brass, etc., in one minute.

A lasting plate of silver that is pure and beautiful. Don't try anything. Use the plater that the other fellow has used and has tested its sterling worth.

One box will plate all the trimmings on your car.

Send \$1.00 today. Don't put it off.

Ten cents will bring liberal sample.

Forest City Sales Co.,  
Fremont, Nebr.

**TOPS BUILT, RECOVERED AND RE-**  
paired.  
C. G. Meyer & Son, Tiffin, Ohio.

**WHITE STEAMER GENERATOR AND**  
burner, almost new. Will sell cheap. Address Box D 245, c/o Motor Age.

**40 H. P. POPE-HARTFORD ENGINE, USED**  
one season, \$175; slightly used R. D. Remy Magneto, with coil, \$25.00; one A. No. 3 Stromberg carburetor, like new, \$15.00; one slightly used Klaxon horn, \$15.00; one model 27 Stewart speedometer, \$8.50. Pope-Toledo parts for sale. Auto Salvage and Parts House, 1436 Wabash Ave., Chicago.

**\$5.00 BUYS BEST 10-FT. AUTO TURN-**  
table; 12-ft., \$7.00. Buy before the rush. W. J. Thompson, Platteville, Wis.



## For Sale or Exchange

**FOR SALE OR EXCHANGE—WAVERLEY** chassis and axle batteries, suitable for coupe or light truck. Will take used Model T Ford in exchange. Box 35, Industrial Bldg., Indianapolis, Ind. r

**FOR SALE—OR TRADE, ONE STUDEBAKER** taxicab. Will trade for touring car or roadster. E. B. Collins, 117 West Main St., Danville, Ill.

**FOR SALE—250 ONE-TON AUTO EXPRESS** bodies, or will trade for truck and runabout. A. TRAUB, Jackson, Mich.

**HAVE MODEL S FORD RUNABOUT** will trade for good lathe and drill press. Box 393, Lincoln, Kas. c

## Auto Wearing Apparel

**ATTENTION—HAVE A FEW MANUFACTURER'S** samples, gentlemen's black broadcloth fur lined overcoats lined throughout with Australian mink. Large, genuine Persian lamb collars, sizes 36 to 48. Value, \$75; will sacrifice for \$35 each. Also several ladies' handsome long fur coats, satin lined, worth \$90, while they last, \$35; and a few large size fur robes, plush lined, \$15 each. All guaranteed new. Examine before buying. Send express charges. Will send on approval. Write or call, E. Roberts, Room 6, 160 West 119th St., New York.

## Parts and Accessories WANTED

**IF YOU HAVE AN AUTOMOBILE ACCESSORY** or any device of merit that you wish manufactured, write the Dayton Equipment Company, Pine and Marshall Sts., Dayton, O.

**WANTED—ONE 1912 5-PASSENGER BODY** to fit 1912 Cadillac chassis. Cadillac Automobile Co., Peoria, Ill.

**WANTED—SECOND HAND CRANK CASE** for single cylinder Brush engine. Address, F. P. Hish, Tower Hill, Ill.

**WE ARE IN THE MARKET FOR JOB** lots of all kinds of car parts; complete and incomplete automobiles, new or second-hand, in carload lots. Give particulars and price when writing. The Jones Auto Exchange, Wichita, Kan.

## Situations Wanted

**A COMPETENT SALESMAN, DEMONSTRATOR** and service man, familiar with southern territory, is open for 1913 position to represent a progressive line of cars and commercial trucks. Address J. F., Colonial Hotel, Birmingham, Ala.

**A CRANKSHAFT SPECIALIST WANTS A** position as superintendent in shop doing own crankshafts. Very best of reference. Address Box D 244, c/o Motor Age. 1

### BRANCH MANAGER.

Experienced man in the trade desires position on salary and commission basis. Box D 237, c/o Motor Age. f

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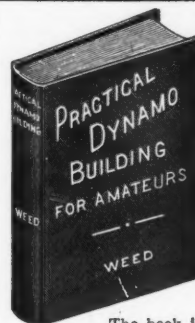
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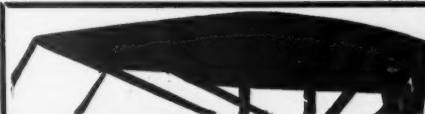
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Lowell, Mass.

ESTABLISHED 1844

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TRADE MARK REGISTERED APRIL 30, 1893

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PRESSED STEEL

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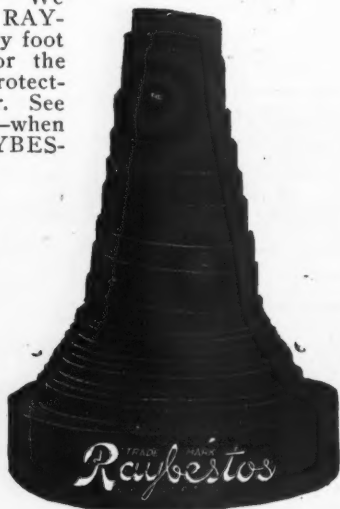
Many inferior imitations are sold to motorists as RAYBESTOS. The popularity of RAYBESTOS—the demand for it, has led a few dealers to palm off the substitute as the GENUINE. We stamp the name RAYBESTOS in every foot of the lining for the sole purpose of protecting the purchaser. See that it is there—when you buy RAYBESTOS.

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But martyrdom to lack of research is another matter.

The modern non-skid preserves tires—it does not damage them. Likewise it prevents punctures.

**Double Grip**  
*Woodworth Treads*

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Painting, Packard blue and black. Upholstering, rear compartment gray plush tufted; front compartment gray leather

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Painting, light blue with gray striping. Small door panels covered with gray wicker work. Upholstering, rear compartment tufted with gray brocade; front compartment black leather.

## *Packard "38" Phaeton*

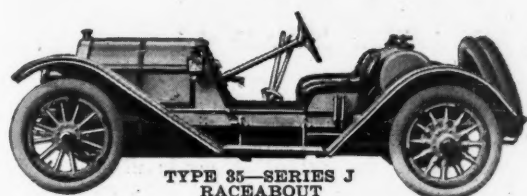
Painting, Veluvine white, dull finish, black striping. Small door panels, black covered with white wicker work. Upholstering, black leather, tufted.

Packard Motor Car Company, Detroit

*Ask the man who owns one*



SHAWMUT TIRE COMPANY, BOSTON, MASS.

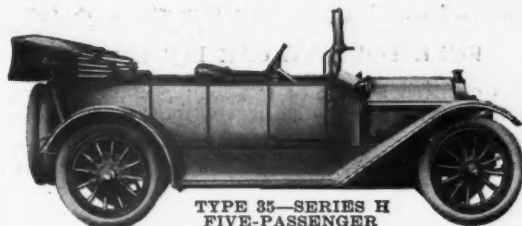


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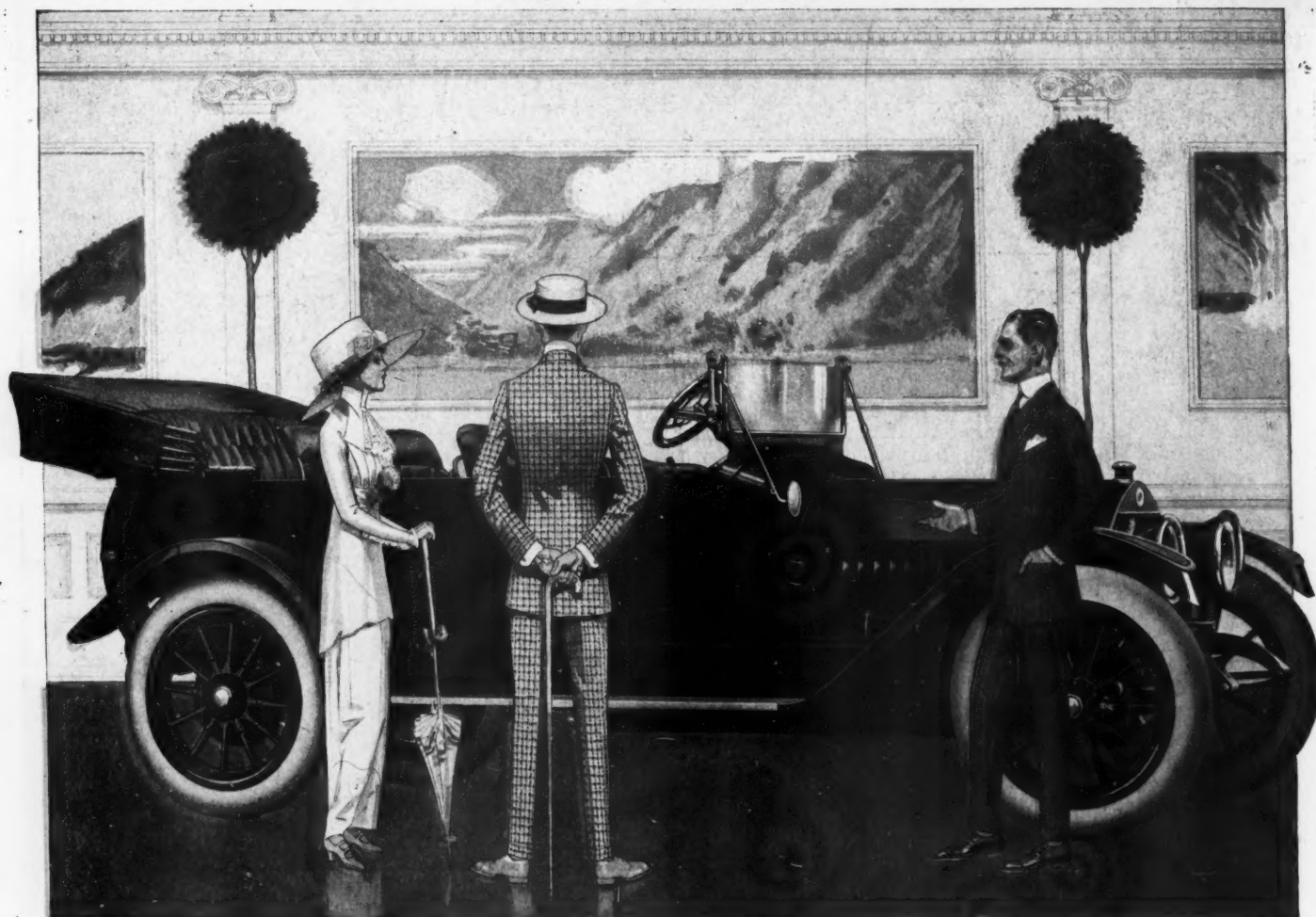
Mercer power and efficiency are well-known qualities. These features are decidedly emphasized in our new series. The various models offer a Mercer for every reasonable need.

**Prices: \$2600 to \$2900**

DESCRIPTIVE LITERATURE SENT ON REQUEST.

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Glidden Tour

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Premier Six in the gumbo swamps  
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Premier Six, Pilot of famous  
Ocean to Ocean Tour in 1911

The start of the Indiana Four  
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1911

